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THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME LVIII.—No. 15. Whole No. 931. | NEW YORK, MONDAY, APRIL 10, 1893. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
JOS. R. THOMAS, C.E., Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND CLASS MATTER.

Published on each Monday of the year, at No. 32 Pine Street, N. Y.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European countries, $4.50 (19 shillings—22½ francs). All payments to be made in advance. Single copies, 10 cents.

Remittances should be made either by post-office order, express money order-registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

Collections are invariably made directly from this office, for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

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BRIEFLY TOLD.

THE MICHIGAN GAS ASSOCIATION.—A communication from Mr. Henry H. Hyde, dated Jackson, Mich., March 29th, came to hand at too late an hour for publication in last issue, but it is with considerable satisfaction we announce that that which its lines reveal has not lost any of its promise because of the delay. Mr. Hyde informs us that on the date in question a large and representative assemblage of the gas men of Michigan was convened at Kalamazoo, and the result of the deliberations was the organization of the Michigan Gas Association. The proceedings in preliminary were completed in clever executive fashion, and the arguments advanced were sufficiently forceful to warrant a unanimous vote to the effect that the best interests of the gas makers of the State would be served by the formation of an Association. A constitution was adopted, and the same was signed by the following charter members:

Robert Calhoun, Bay City.	J. M. Calkins, Big Rapids.
C. H. Call, Marquette.	E. F. Cooley, Lansing.
S. Dean, Owosso.	G. L. Denham, Flint.
H. W. Douglas, Ann Arbor.	W. M. Eaton, Jackson.
C. M. Edick, Benton Harbor.	A. J. Emlaw, Grand Haven.
Arthur G. Fox, Marshall.	E. F. Gallagher, Ionia.
Thos. D. Gilbert, Grand Rapids.	H. E. Hooker, Charlotte.
J. J. Howden, Muskegon.	Henry H. Hyde, Saginaw.
W. H. Morgans, Pontiac.	J. S. Morton, Benton Harbor.
Chas. Neundorf, Saginaw (West).	Ira A. Remsen, Kalamazoo.
Chas. H. Raynor, Adrian.	H. L. Wallbridge, Grand Rapids.
Joseph Walker, Port Huron.	John Ward, Battle Creek.

The following honorary members were also elected:

W. P. Bonney, Erie, Pa.	George Osius, Detroit, Mich.
John D. McIlhenny, Phila, Pa.	E. Woodbury, Kalamazoo, Mich.

The organization was then perfected by the naming of the following officers to serve for the ensuing year:

President.—S. Dean.
Vice-President.—Thos. D. Gilbert.
Secretary and Treasurer.—Henry H. Hyde.

It was determined that the Association should hold annual meetings, the opening times of which are fixed for the third Wednesday of February, and it was ordered that the next meeting place should be Grand Rapids.

We welcome the new comer with the heartiest greeting possible, and are confident, from an inspection of the names on its roll, that the youngster is so sternly sponsored that it cannot fail to be in short time a lusty promoter of the gas interests of the Wolverine State. We notice that in the charter membership no name representing the Detroit Gas Company is given, but we fancy—in fact, believe—that this omission is not to be taken as a sign of either neglect or indifference, remembering that the gas men of Detroit are now in the throes of housecleaning, or redecorating, so to write. Those who know Messrs. Croul and Baxter, and so are cognizant of their firm belief in the benefits to the industry and to the individual that come from participation in these annual meetings of our Associations, know full well that matters must have been pressing with them at home to keep either one or both from assisting at the Kalamazoo proceedings. However, latter days will tell of their fealty, and of their material assistance. We have not received a copy of the constitution, and so cannot say whether active membership in the Association is or is not confined to residents of the State of Michigan, but persume that such is the law. In any event, we expect shortly to receive a copy of the articles. The first board of officers is a strong one, and if they are given, as undoubtedly they shall be, the united support of the rank and file, a rousing meeting at Grand Rapids next February is a certainty. No doubt the gentlemen considered carefully the date most available for the annual assemblage, and must, therefore, have had good reason for fixing upon the third Wednesday of February; but we, looking possibly more towards the perplexity that it will involve us in than for any other leading cause, remember

plainly that the New England Association also opens its proceedings on that day. It looks, too, that April would be a better month of the year for comfort in Michigan, as winter very seldom stops making advances in that direction until March has melted into April, and had April been selected the meetings would come along in sequence, a close one, it is true, but not too close for comfort. Still, as before remarked, no doubt the Michigan men did not act unthinkingly, consequently it must be accepted that they did not act unwisely.

DETROIT VOTES FOR MUNICIPAL ELECTRIC LIGHTING.—Writing of Michigan matters, we might complete the reference by reporting that Mayor Pingree and his associates, who have had the buzzing of the municipal lighting bee under their bonnets for many moons, have so far carried their point, practically, as having secured the consent of the voters of the city, at a special election held for the purpose, on Monday last, to their proposal "as to whether the said city shall construct and maintain a plant for lighting the city by electricity." The proposition was indorsed by a fairly large preponderance of the voters, and it remains to be seen what the Mayor and his fellows will do with the permissive license of the citizens. In the meanwhile, even though the practice did savor of causing its followers to be somewhat "ahead of their ticket," the Mayor has secured estimates of the probable cost to the city of arc lamps per annum under the different types (three in number) of stations proposed. The figures will be found in our item columns for this week; and we must say that the propositions as figured out by Mr. Rae, the electrical expert appealed to by Mayor Pingree, are very flattering to the maintenance of electric arc lighting by the city. Under estimate No. 1 the cost per lamp per annum (2,000 candle power), "everything in," including interest, depreciation, etc., is returned at $62.09 on an all night and every night lighting table; estimate No. 2 based on a lighting schedule of 2,183 hours per annum, gives the cost per lamp per annum at $51.77, and estimate No. 3—also, on an all and every night basis—puts the cost at $66.33. The three estimates provide for a plant rated to maintain 2,000 lamps. Mr. Rae's statements are not to be taken without a liberal dose of salt, as one can readily determine from even a cursory examination of the same, and it should also be borne in mind that they have every appearance of a framing favorable to the desires of the sellers of electric apparatus. Elsewhere in this issue will be found, in our report of the Ohio Association, in the discussion on Mr. Hurlburt's paper, which paper seems to us to contain many truths, some remarks contributed by Mr. Starr, of Richmond, Ind., who has "been there," in the instance of trifling with electric lighting supply, and who seems to have regretted or to be regretting the venture. Perhaps Mayor Pingree knows just where he is in respect of this electric lighting scheme, and so may not have any of the fear that led Mr. Starr to blurt out the words, "For God Almighty's sake, don't," in reply to the electrical machinery man's proposition to secure for Mr. Starr a 10 year's contract, for the public lighting, at $85 per lamp per year, provided Mr. Starr purchased his electrical apparatus in the right shop. Whether so or not, Mayor Pingree ought to go slow, for if he "Don't," Detroit will have made an investment of, say, $600,000, that might at best be a very unproductive one.

THE COOKING SCHOOL EXHIBIT.—We have received some definite assurances during the past week, that the gas companies and apparatus manufacturers of this State are willing to materially assist the World's Columbian Cooking School Exhibit, under the executive direction of Miss Juliet Corson. We would urge that the matter be taken hold of at once by a committee, representative of the gas making and gas apparatus divisions of the industry, so that a reasonably fair fund be put together to help Miss Corson show gas for cooking at its best. We submit the following extracts from a letter to hand from Miss Corson, dated April 4th: "I have just returned from Chicago. * * I do hope the gas people will move at once. If they are disposed to help me I can do well for them. I am to have a portable building, near the Department of Hygiene and Sanitation, which is in charge of Dr. F. C. Brewer. If I could know directly how far I can depend upon your constituents, I might perhaps enlarge my space. All the elements are harmonious, in so far as all wish our Exhibit success. Even the Committees that wanted to force us into the wholly inadequate time and space of the Woman's Building, still all the time wished us success. Well; the lions are all caged. In a few days I return to Chicago to arrange the details of our entire work. * * * In my little house I am absolutely free to use any appliances I may deem most suitable." We repeat that we hope some prominent men in the city will at once take steps to arrange for the collection of a fund, for the object is a sterling good one.

[OFFICAL REPORT—REVISED BY THE SECRETARY.—Continued from page 478.]

NINTH ANNUAL MEETING OF THE OHIO GAS LIGHT ASSOCIATION.

HELD AT COLUMBUS, OHIO, MARCH 15 AND 16, 1893.

FIRST DAY—AFTERNOON SESSION.

Mr. H. L. Hurlburt, of Oberlin, Ohio, then read the following paper, entitled

SHOULD SMALL GAS COMPANIES PUT IN ELECTRIC LIGHT PLANTS?

I was induced to present this subject in the hope that some one might be benefited by our experience, and that we might get something from the discussion which would help us in our present difficulty.

While our position could form no comparison with that of the larger companies, I think the smaller companies either have had something of our trouble, or will have it in the future, principally for the reason that municipal ownership is considered more practicable in the smaller places, where there is less danger from the political rings. We had had some discussion of the electric lighting question by our City Fathers at different times, but not in a way to amount to anything definite, and there appeared no prospect of any trouble with the Council; so, after consultation with parties who were in the electric business, and on their recommendation, we decided to put in a plant, and, after having put a few lights on the streets, to ask the Council for a contract. The results were anything but what we expected; for we had no sooner commenced work than the Council, or some members of it, renewed their efforts to work up public sentiment in favor of a city plant.

We offered everything possible in the way of inducements, and even went so far as to offer to furnish the lighting at the actual cost of manufacture, they to pay us interest and depreciation.

But the outcome is that they have submitted a proposition to the citizens to issue bonds for the purchase of a plant for the city. This is not a very flattering prospect, when you consider that we have a power plant large enough to supply both the commercial and street lights, without enough business now, and no prospect of there being enough in the near future to make a commercial plant a paying investment if run separately from the street lighting.

Probably, after what I said, it will not be necessary to state that our advice to any one thinking of going into the electric lighting business would be to go very slow, and at least to be sure of the street lighting at a good figure and for a long period, so that you would not be troubled with the city for a competitor.

It is a question which I would like to hear discussed, whether it would not be better for a small company, even if it had the contract for street lighting with electricity, to furnish only gas for commercial purposes. I believe that in small places the demand for more light will be nearly as great with electric lights on the streets as though they were used for commercial purposes, and what increase there might be would be where it would not take as large an investment, and where in most places it would call for practically no additional outlay. It seems to me a serious matter for a small company to divide up its business between gas and electricity.

Then, the question of municipal ownership is coming more prominently before the public, and in a form which it is very hard to meet; as, for instance, the low cost which they claim to attain in places like Granville, this State, where they claim to produce a 2,000 candle power light for about $20 a year per lamp, as run by the city.

We have had trouble in meeting the figures advanced by the opposition to the gas company, for the reason that we had no reliable statistics at hand in regard to the municipal plants which are claiming such large success. In cases of those which we have been able to follow up we have found some loopholes in the figures (as, for instance, the case of Dunkirk, N.Y.), which enable them to get at the results which they claim.

I wish that some one from this Association could be appointed to gather all the information on this subject which it is possible to get, and put it in the best possible shape, to be presented at our next meeeting. I believe that it would be of great value to a large number of our members.

Discussion.

Mr. Nash—If I am not mistaken, at the meeting last year Mr. Hurlburt asked me what I thought about the scheme of putting in an electric light plant, and I told him I thought it would be better to leave it alone, and he evidently thinks so now. If a person can get a long con-

tract at a good figure, and get the exclusive privilege, it is probably a good thing; but if you have to depend on a short contract and the uncertainties connected with it, I think it is just as well to let some one else do the electric lighting, letting the gas company attend to the gas business. He says here, "After consultation with parties who were in the electric business, and *on their recommendation*, we decided to put in a plant." They are just the people that do recommend it every time—the people that are in the electrical machinery business. Persons selling dynamos, of course, make out that it is very important, or necessary, to have a plant, but you must not forget they are in business themselves, and, of course, wish to secure the sale of as much electrical machinery as they can without much regard to the profits to be made by the persons to whom they sell. I would only say that if the gas companies are going to have competition, and it is a question of putting in more capital in order to meet it, it would pay them better, I should think, to make additional investments in their gas plants, and then if the city puts in the electric light plant, so much the better. I think it is better for a town to put it in and run the street lights, and let the gas company do the commercial lighting, rather than to leave the field open and have another company come in and also take the commercial lighting.

Mr. Greenough—This paper opens up a pretty wide question, and one which I think the gas companies have got to meet in this part of the country on the lines which have been adopted by the Massachusetts Legislature in the Municipal Lighting Bill, which was passed year before last by them. There were several attempts made by different towns in Massachusetts to get permission from the Legislature to supply gas or electric light, chiefly electric lighting; and I guess, for three years certainly, they were defeated by the combined action of the gas and electric companies and the general indifference of the public. But there were several cases in which there seemed to be no reason why the town should not be allowed to supply its own lighting if it wanted to; and there being a standing law or rule in Massachusetts that no special legislation shall be passed if a general bill can be provided, we took hold of the thing and saw that a fair bill was passed. At the present time any city or town in Massachusetts can go into the business of electric or gas lighting, if they want to, and issue bonds therefor, but it must be done with precaution. It will not be possible for a corrupt city government to use its power as a club, and to pass a bill in one year at one session of that government permitting them to erect a new gas, or a new electric light works. It must now not only be passed on by two city governments, but it must be submitted to a vote of the people, so that the public may have time to consider whether they want to bond their city for the amount which it will be necessary to raise to erect a gas or an electric plant. And, moreover, the bill provides—and it is a just bill and a perfectly fair provision also—that in any city or town where there exists a gas or an electric light plant, the city or town must buy that plant out, and if they cannot agree upon the fair valuation of the plant, they are to go to the Supreme Court of the State, which is to appoint a commissioner, who is to say what the plant is worth. The Legislature recognizes the vested rights of corporations which have put their money into a plant, under the protection of their laws, and it does not propose to have them ruined without their having some reparation. They are, therefore, secure in getting a fair price for their property, if a city or town wants to go into the business. They know too much to permit free competition either in gas or electricity in municipalities. They have had a bitter experience in various places, and they don't propose to have it done again. A gas company is now reasonably secure from competition by submitting its price and quality to the Gas Commission, who have entire power to regulate the quality and price, and, on petition of any 20 consumers, can examine and report upon the matter. Since that law was passed, nearly 10 years ago now, there has been no competing company introduced into any city of Massachusetts, until recently there has been an effort made in Boston, which may or may not be successful—the charter for supplying gas in Boston existed before the law was passed. However, both the gas and electric companies under the Gas and Electric Light Commission are protected, and there is security given them to their property. And now there is this additional security given their property against competition by the city or town, for unless the city or town pays a reasonable and fair price for the property, they are unable to go into competition with them. And when a gas company is the possessor of an electric light plant, as well as of a gas plant, and the city does not want to go into the gas business, but only into the electric light business, then the electric light plant is to be valued by the commissioner, and the city must pay that price and take the property before it can go into business. It is fair, and was so recognized as such by the Legislature, when it was passed two years ago. The question has to be met in this section of the country, and the gas and electric light companies have got to have protection both for their gas and their electric light plants against municipal lighting. I don't suppose it is possible to do it this year, but the spirit of municipal ownership of corporations of all kinds is in the air; and the sooner the principle is established the better it will be for the corporations of all kinds doing business in this State. (Applause.)

Mr. Nash—I would like to ask Mr. Greenough if he does not think that that is the only measure that will give companies relief, to make them safe?

Mr. Greenough—I do, sir. The reason I got on my feet was because you spoke of the protection which would come from a long contract with the city. I do not think that is a protection. The proper remedy is to recognize the protection which is due to a capital invested under the laws of the State, and that its owners are not to be robbed by anybody, whether it be a private corporation or a municipality.

Mr. McCook—I would like to ask Mr. Greenough, in case a municipality determine to buy out an electric plant, leaving the gas plant in private hands, whether the municipality goes then into commercial lighting as well as street lighting?

Mr. Greenough—Yes; they can, if they want to. It enables them to go into either kind of lighting. It is possible in Massachusetts under the previous laws they could have lighted their own streets, but the corporations are not satisfied to do that; if they go into the lighting at all they want to go into the whole thing.

Mr. McCook—Is there any case in Massachusetts where they have taken a gas plant and left the electric light plant?

Mr. Greenough—No, sir; the thing has never been done at all. There is one small town where they are trying to do it now, and are kicking against the law. Finding that they have to pay a reasonable price for the plant they have appealed to the Supreme Court to see if they can upset the law. But I believe that the law is a fair one and will be enforced.

Mr. Nash—I would like to say, Mr. Chairman, that it would be the only fair way; but the trouble is to get fair treatment. In cities where there is not city lighting, the electric people wish to sell their dynamos, and that is all they care about. They will sell a plant to the gas company, and then will go in two or three years afterwards and sell to competitors. There is not a particle of honor about them; that is my experience with them.

Mr. Greenough—In reply to that, it must be remembered there are a good many companies of each kind in this State, and the electric light companies are just as much interested in this thing as the gas companies. Where the gas and electric companies work together, they have a good deal of political strength, if they see fit to exert it, and legitimate strength, too.

Mr. Gwynn—I think the mistake Mr. Hurlburt made was in not getting a contract out of the city before he started his plant. I think he did perfectly right so far as starting the plant was concerned, but he did wrong in not getting his contract with the city before he started.

Mr. Hurlburt—I wish to say here that there seems to be a wrong impression on the part of some, that we went into it on the recommendation of the electric supply men. The advice and recommendation that I speak of were from men who were suppliers of light, and not particularly agents of the electric supply companies.

Mr. McCook—You say that at Granville they claim to produce a 2,000 candle power light for about $20 per year per lamp, as run by the city? That is worse than anything I have ever heard of yet.

Mr. Hurlburt—The Chairman of the Light Committee of our Council made that report to the Council.

Mr. McCook—Oh! that is the best authority you have then?

Mr. Hurlburt—He claims to have had the report from the managers of the plant at Granville.

Mr. McCook—Yet that was merely his claim. I would like to ask whether they are supposed to light all the lights every night and all night?

Mr. Hurlburt—I don't know as to that, but I believe until 12 o'clock.

Mr. McCook—I suppose only until 12 o'clock, and not on moonlight nights at all.

Mr. Hurlburt—I don't know how many hours they did light.

Mr. Gwynn—Is that plant at Granville owned by the village of Granville, or is it owned by the street car company which runs the electric line from Newark to Granville?

Mr. Hurlburt—It is owned by the village, and is run in connection with the water works.

Mr. Penn—For the benefit of Mr. McCook I would like to tell him a little piece of information that I received. Some of my neighbors have

gone into the municipal lighting business, and they furnish a so-called 2,000-candle power lamp at $3, or "two for a nickel" (laughter)—two for $5 I mean; and if you take three you get them for $7.

Mr. McCook—Ten o'clock light?

Mr. Penn—No; they run to midnight, or run all night if you want them to on dark nights.

Mr. McCook—I am glad I don't live in that part of the State.

A Member—I would like to inquire what town that is.

Mr. Penn—Wilmington, Ohio.

A Member—Is that plant owned by the city?

Mr. Penn—Yes, sir; it is.

Mr. Starr—That is interesting, very interesting. I am an electric light man myself, and I would say that there is an element of cost in the electric light business that they never take into account. You erect an electric light plant, and in 15 years it is not worth 10 per cent. of its cost. You run a boiler for 15 years at 100 pounds pressure, 24 or 20 hours a day, and you find it is not worth much. The very best makes of boilers after that number of years are practically worthless. You run an engine for 15 years with 100 pounds pressure of steam on it, and it is not worth 10 per cent. of its original cost—not worth much more than scrap iron. A case in point. Parties learned that I was talking about increasing my electric light plant, and the Ball Engine Company, who make an excellent engine for the kind, both double and triple expansion, sent me a card with illustrations of some engines on it, and the cost of the same. I wrote back, saying, "I wish you would give me the price of those old engines to be repaired;" and they sent me back the price, ranging from $600 to $900. If they had taken them into the shop and thoroughly repaired them, removed all the worn parts, repaired the cylinders, and made them all new apparently, or I presume as good as new, they then offered them to me at from $600 to $900. I also requested the price of the new ones, and had them quoted to me at from $1,200 to $1,600; and those engines which I asked them the price of repairing had only been running 5 years. They had depreciated 50 per cent. in 5 years. You know that every electric light pole in the street would be rotted down inside of 15 years; that is 7⅓ per cent. I guarantee that the lamps won't bring 10 per cent. on the first cost after that many years, and can only be used for scrap iron. Then take guy wires and ropes; they have to be renewed every 2 to 3 years. Generally the rate of depreciation is put at 5 to 6 per cent.; but it ought to be 10—certainly not less than 7½. I hunted up some statistics on electric lighting, and found one town in our State that represented to our Council Committee that the cost of an electric lamp was $26.72 a year. I took the trouble to send an expert there to examine their books, who took an account from their books of the cost of everything, and added interest at 6 per cent., taxes so much, interest so much, then the depreciation. After giving the works credit for the receipts for incandescent lighting, the balance made from arc lights proved the cost to be just $88.88 one-half year. Now, that is calculated with reference to the depreciation. While they don't have to pay that as they go along, they will have to pay it some time—and you can just bet your last dollar on that; and when you come to rebuild your works entirely you will find that what you have been estimating as profits have, in fact, been actual loss. I have been running an electric light plant for the last 7 years. My books show a balance of $6,500 in its favor; but I have run more than one-half of that time with water power, which did not cost me a cent. The balance of the time I run my engine with an engineer who, being a Godly young man, worked for nothing. (Laughter.) He doesn't like to charge those who are oppressed (renewed laughter), so he has worked now for nothing for 7 years, never charging me a cent, either for firing or for tending to the engine. I tell you he is a good young man, and I appreciate him highly. (Continued laughter.) But with all that, my outside wires are pretty well rotted down. Some lamps that I examined the other day will have to be repaired at a cost of $18 to $20 apiece. I sent last week for a new magnet, and for new governors, and I find that everything about the plant has to be made new every once in a while. Well, now, with expenses like that, unless you get prices like they get in Philadelphia, you cannot make a cent; that is my verdict on it. When I examined the cost of this thing I was told I could run the plant, with coal at $2.50 a ton, for $17,710, generating electricity for 150 street lamps; but I tell you this question of repairs and expenses made some difference in the estimates. But that is what the man said that was selling the works. Now, I have found there is considerable difference between the man who sells and the man who buys in the electrical business. I went to the Chief Engineer of the Thomson-Houston Company at Cincinnati, Mr. Malan. He is a good man, a nice man, and I believe he gave me honestly what he thought was the fact. He placed the cost of running that plant for one year at $17,198. Well, that was so much ahead of the other fellow that I went to Chicago, to the Westinghouse Company, where Mr. Cook, a very prominent engineer and electrician, gave me as an estimate of what it would cost to run it, $18,430, and I think he thought he was telling the truth. I then went to another concern, and they gave me the cost at $17,179. I then went to the Chief Engineer of the Western Electric Company, who gave me the cost at $16,798. One of these gentlemen, when I was trying to get the contract for Richmond, was very anxious I should take it and buy the machinery of them. He said, "Starr, I will get you that contract for 10 years at $85 apiece for those lamps." Some of you may think that was a very good thing, but I tell you that that would have left me $50,000 in the hole. That is just what it would have cost me. I spoke to him very imploringly, and said I, "For God Almighty's sake, please don't. You just get that contract for *one* year, and if I don't like it after that I will quit it." (Laughter.) I wanted to be on the safe side, and I told him I wouldn't contract for 10 years if he gave me a bonus of $5,000. I have had a gas works for sale for some time, and inquired of a very prominent Company if I couldn't make terms with them. The first question that they asked me was, "How about your electric light plant?" Well," says I, "That goes in with it." Says he, "We don't want it; we don't want it." "Well," says I, "I don't want to keep it; I have had it long enough," and he dropped the subject. There is just this thing about it: While I advocate a small gas works—and I think I was the first man in the United States to put in an electric light plant in connection with my gas plant—putting in an electric light plant, because you want a *stock of goods* which will satisfy the wants of your customers. If a man is in the dry goods business he wants to have whatever goods his customers desire. I found parties in our town that wanted arc electric light, and went to work to put it in, and have been running it now for 7 years. Finally, they wanted incandescent lighting; I got that and put it in, and I have had about 100 burners running for about two years. And I have gas; we furnish 22 candle gas; but I tell you it is uphill business to run an electric light plant. I told some parties some time ago that if I could get a contract like they get in Philadelphia I would drop the subject. I would not mind running an electric light plant, if I were paid like they are in Philadelphia, where they get $143 to $207 for their lights. Now there is some money in that; but, I don't know—when you come to count the cost of getting that kind of a contract it may cut off some of the profits. (Laughter.) I could cite an example in point, but I do not know whether I ought to tell it.

A Member—Go on.

Mr. Starr—Well, I believe I will. When I made that remark to a prominent electric man, he said—well, since I come to think I won't tell it either. (Laughter.) That is not the way we gas men do—but it was funny. (Laughter.) Of course, that kind of a contract will pay. You go to New York, or Philadelphia, or Brooklyn, and other places, where they get $125 per year and upwards for lamps; that will do, that will pay. You can afford to rebuild your works every 15 years and get out even anyhow; but, with the prices which we are able to get, I don't know really what would be the result. We make electric lights in our town pretty cheap, but if they think there is any great profit in it they are mistaken. If you have electric lights (arc and incandescent) and gas, you can supply any customer you have with whatever he wants. But I believe I can say truthfully the 28 commercial arc lights that I am running have been put in in 100 places, and my customers have never been charged with the putting in or the taking out. I have put in wires for incandescent lights also, in a good many places, and not charged anything for it. You have all this expense. I was talking to a man some time ago, who said his electric light plant cost $100,000, and that he was making money. I just bet him he didn't make 10 per cent. on his first cost. If he does do it now, he won't average 10 per cent. for 10 years, for he will find after a while that things wear out.

Mr. Hurlburt—If we had statistics, such as Mr. Starr has given us here, from the towns that had actually made the experiment, instead of such big reports from the people who were claiming to do such great things, we would be better off. If we had had something definite, at the time when the matter came up in the Council at Oberlin, that we could have presented to them, we could have stopped all the trouble that we had. One of the objects I had in writing this paper was to provoke discussion so that we might all be informed as to the actual experience of the different members, so that when other companies have this question up, they will have something to refer to that they know is correct. In all the reports I have been able to find, there is so much difference that but little reliance can be placed in their accuracy. For instance, I find the municipal plant in Little Rock, Arkansas, inside of two years had made three different reports to the

Council, and there was 100 per cent. difference in them. I referred in my paper to the report from Dunkirk, N. Y., printed in Prof. Ely's work on "Political Economy," in which he states the cost of their lights, as quoted from the superintendent of the plant, and also the cost of the plant; figuring 5 per cent. interest and 6 per cent. depreciation on the cost of the plant, leaves them less than a dollar a year apiece for their lights, which shows that there was something radically wrong with their figures. Now, if we could have the correct showings made by the different plants, with interest, taxes, insurance, depreciation and all those things figured in, I don't think the small companies would have near the trouble with their Town Councils that we have had with ours.

Mr. Persons—The Gas Commissioners of Massachusetts printed a table of, I think, 59 electric companies running in that State, and 54 of them showed a loss. One or two came out even, and one or two were able to show some profit. That table can easily be gotten by writing to the Gas Commissioners of Massachusetts.

Mr. Wm. McDonald—The paper which the gentleman just read asks the question, "Should small gas companies put in electric light plants?" Now, it seems to me that, so far as he is concerned, it don't make much difference how this question is answered; but I have looked very carefully into this subject, being interested in some small gas plants, and have concluded that it does not pay a small gas company to put in an electric light plant. I have come to this conclusion after very much investigation. I know it looks alarming to a gas company to realize than an electric light plant is almost certain to be put in the town, no matter how small it is, which is to take away at least one third to one-half of their business; but careful investigation has convinced me that if a gas company in a small town could spend $10,000 or $12,000 more upon its gas plant, and sell its gas cheaper, it would pay it better during the next 10 years than it would to put in an electric light plant. I am convinced such companies would be better off in the long run. While they would have to stand by and see their business taken away to a certain extent, yet, if they attend exclusively to looking after the gas business, secure cheaper and better gas, and spend their money accomplishing that purpose, they would be better off in the long run than if they would spend that money in establishing an electric light plant, from which ultimately they would get very meager returns.

Mr. Persons—I have talked with a great many gas men in small towns, who say that after the first month when an electric light plant has been installed their gas consumption has begun to increase. I do not know of a town that has ever reported a loss in the output of gas by having an electric light plant installed in the town. It seems to increase the demand for light, and they look for consumers in other channels, for heating and cooking and in that line, and work up a larger consumption by the end of the year.

Mr. Nash—Our experience has been that we have had less trouble since we have had an opposition company than we had when there was no competition. There is less complaint about the gas. The people seem to think the comparison is so much in favor of gas light—that it is a very good, reliable light; and when they come to pay their bills everybody is satisfied, whereas the consumers of electric lights are constantly complaining, so we think we have the better end of the situation. If a gas company does put in an electric light plant in order to control the field, not on the theory that it is going to make anything, but simply in order to protect its interests, it does not mean that it can control the field very long, for some one else will come in and either blackmail them or put in another plant, and then their expenditure will be for nothing, because they will have opposition anyway. So I think, if they would take the same amount of money which would be required to install an electric light plant and put it into improvements on the gas plant, the chances are they will be better satisfied.

Mr. Boyle—A little experience in the town of Salem may be of value to the Association. Five years ago the Gas Company began agitating the question of putting in an electric light plant. Towns all around in the neighborhood were doing the same thing, and the Salem Company thought it advisable to do it; their funds were small, however, and they concluded not to do it. Other men stepped to the front in the town and secured the franchise for 10 years, got a contract from the city to light the city for 5 years, and built their electric light plant. They put about $35,000 in their plant. For a while they affected the gas company, but after that we went right along, and last year we sold more gas than we ever sold before in any one year. The increase each month has been going on beyond all expectation of the gas company. Now the electric light company's plan has been to make additions to their plant gradually, in a sort of piecemeal manner, not realizing the full necessity of the situation in the future, until it is a piece of patchwork and will have to be remodeled entirely. But worse than that, their 5 year contract has elapsed, and they are unable to make a satisfactory contract with the city. The city to-day is advertising for tenders for a new electric light company, and is receiving bids from several companies for the erection of a new electric light plant. That has been brought about partly by the fine representations made by men who have electric machinery for sale. They will agree to furnish incandescent lights for 50 cents a month, or $6 a year. These men cannot possibly do it, and make even a fair showing, or pay the interest on their investment there, under $16 or $18 a year. Now they are unable, as I say, to make a contract with the city, they have a 5 years' franchise with a new competitor in the field, who will rob them of their whole investment. We flatter ourselves that we are in the best position of the two companies, and are about to remodel and put what our plant originally cost into new apparatus.

Mr. Gwynn—I would like to ask Mr. Boyle, do I understand that the price that the electric light company receives in Salem for street lighting is $6?

Mr. Boyle—That is my understanding.

Mr. Gwynn—I beg your pardon; they are receiving $12 now.

Mr. Boyle—You misunderstand me; what I mean to say is these electric light men who recently came in with their estimates said that they could, by putting up a municipal plant, furnish lights at that price. That is what got the idea into the Council originally of building a municipal plant. They said they could furnish lights to the town and make money on it for 50 cents a month

Mr. Gwynn—Were not these the Fort Wayne people?

Mr. Boyle—Certainly; the prime mover was Mr. Cooper, of Fort Wayne.

Mr. Gwynn—He wished to make a compromise, as I understood it, at Salem, and wanted to get the electric light company to use his system, and said, "If you will put this machinery in and shut out the Westinghouse machinery, we will step down and out, but if you don't, we will fight you!"

Mr. Boyle—It is not that they can do it for that money, but they are simply using that as a lever to make the Salem people put in the Fort Wayne system. That is all they are after. Recently Mr. Cooper has made a bid to the city offering to put in an electric light plant, and he has showed the city just what they can do. He has given them their figures, and has taken a committee of the Council down to Loudonville to show them the plant they are putting in there.

Mr. McCook—Mr. Cooper proposes to sell this plant to the city; he don't propose to run it?

Mr. Boyle—He says he will make a bid to the city on that basis. Of course, they will ask him to give bond to carry out the bid, and I don't suppose he can do it.

Mr. Gwynn—I want to ask another thing. With the plant put in by the city, and in operation, and the present plant run by Mr. Davis, while these two companies are fighting one another, where will the gas company be all this time? Where is their business going, if prices go down, as you claim, to a nominal 25 cents a month for lamps? Where will you be all this time?

Mr. Boyle—The gas company has a reserve, and I think we can hold out as long as the electric light companies can.

Mr. Gwynn—But are you making any money while they are doing that? Is the gas company going to declare dividends in the meantime?

Mr. Boyle—I might answer Mr. Gwynn by asking if the electric light companies will not lose more money than we will?

Mr. Gwynn—But you don't want to forget that while they are fighting your business will suffer.

Mr. Boyle—It may.

Mr. Gwynn—Certainly; it can't help it.

Mr. Boyle—It will suffer temporarily, but not very long.

Mr. Gwynn—If you form a combination, then you will have opposition just the same. You will never get rid of that.

Mr. Boyle—The gas company was never in a better position to meet opposition than it is now.

Mr. Gwynn—I think if you had put in an electric plant in connection with your gas plant, you would not have had the third party in there to compete to-day, and you would have been able to get a fair price for your lights too.

Mr. Boyle—You are flattering me with "working" the Council.

Mr. Gwynn—Mr. Hurlburt spoke of not being able to obtain any information as to what different plants are doing, what prices they receive, etc., one city as compared with another. If you want that information, all you have to do is to join the National Electric Light

Assooiation, and write to its Secretary, who will furnish you that information free of charge—furnishing you all the information you want in regard to any electric plant in the country. He will furnish you with all that data that you were speaking about; all the reports, and any information that you see fit to get.

Mr. Wm. McDonald—Is he paid by the machine men, or by the consumer?

Mr. Gwynn—Paid by the central stations. There are 100 and odd central stations, or companies, and he is hired by the central stations throughout the United States to act for them. He has nothing to do with the machinery or supply men at all. They do not have a voice or vote in the Association, or take any part in the transaction of the business of the Association.

Mr. Miller—Do I understand Mr. Gwynn to say that each electric light plant furnishes a report of its business to be given to anybody who wants to know how that business stands?

Mr. Gwynn—The Secretary of the National Electric Light Association is paid by the year, by the Association, the same as the Secretary of this Association is; and if Mr. Hurlburt is a member of that Association, the Secretary will supply him with any information that he can obtain. He makes that his business the year around. That is what he is there for.

Mr. Dittmar—I would like to inquire whether he would give all the information he possessed to anybody who would come to get such information? Would he give the business of the different electric light companies away, broadcast all over the country, to whoever might ask for it? I don't think the companies would agree to that.

Mr. Gwynn—The information that this Secretary furnishes is only furnished to parties belonging to that Association, the same as any information I would give to Mr. Butterworth, if he would ask for it, for the benefit of the members of this Association, to be given by him to any of its members on application. It is not to be used broadcast. The information that he would get from them would not be given to the public, but only to the members that belong to the National Electric Light Association.

Mr. Dittmar—Could such information be of any use? Supposing, now, I belonged to that Association, and wanted to get at your business, for a purpose, to use in my business; and suppose, for instance, I wanted to present it to the Council in order to get their good wishes, and I would take those figures before them, wouldn't that be broadcast? Wouldn't that be showing your business up before other people?

Mr. Gwynn—Yes, provided that was done. But the information Mr. Hurlburt was seeking, and said he could not get, was not the profits that they are making, but what prices were received for lights, how the plants were operated, the life of the plant, and all that. He says he can't get that information. If I asked you what profits you were realizing in the gas business you would not give them to me, or anybody else, to go broadcast. But the information that Mr. Hurlburt asks for in regard to electricity was as to the different kinds of plants, what prices they were getting, the cost of construction, the cost of maintenance, cost of coal, the amount used, and everything of that nature.

Mr. Hurlburt—I think Mr. Gwynn is right; if a man has the statistics you speak of he would be able himself to figure out the comparative cost without a bit of trouble.

Mr. Gwynn—I would like to ask Mr. McDonald a question. He said he did not consider it wise for gas companies in small towns to engage in the electric light business. What size of towns did you limit that to?

Mr. Wm. McDonald—I was speaking of about the size of towns that the gentleman referred to in his paper.

Mr. Gwynn—What is your population? (Oberlin.)

Mr. Hurlburt—About 5,000.

Mr. Wm. McDonald—I would place the figures as from 4,000 to 8,000.

A vote of thanks was then tendered to Mr. Hurlburt for the paper read.

Mr. J. F. Seamon, of Uniontown, Pa., then read the following paper:

IS THE WILKINSON PROCESS ECONOMICAL FOR SMALL WORKS.

Having been asked by our Secretary to prepare a paper on the above subject, I felt at the time somewhat reluctant in granting his request, for reasons best known to myself, but taking the matter under careful consideration, I gave my assent. It is my intention to treat upon the subject from a local standpoint, with an introduction, a description of the plant, and also of the method of operating the Wilkinson process.

The process, as I have presumed, is not generally known. Its first erection was made by the Mutual Gas Company, of New York, some years ago, where it is still in operation. Having proved its efficiency at that works, other plants of the same type were erected at Baltimore, Md., Washington, D. C., and one or two other cities of the same size. The Wilkinson process differs from other systems of water gas processes, excepting the Tessie du Motay, and one other which I cannot recall at this writing, in that it is continuous and non-intermittent. The plant constructed at Uniontown, Pa., consists of a hydrogen generator, scrubber, illuminator, bench of retorts, exhauster, condenser, purifying boxes, etc. It daily capacity is rated at 100,000 cubic feet. The hydrogen generator is run independent of the other apparatus; no hydrocarbons are introduced in the generator whatever, it being used to make a water gas alone. The generator's external diameter is 5 feet, height 17 feet, and internal diameter 3 feet. It is lined with circular firebrick, 1 foot in thickness. The blast for the generator is furnished by a Wilbraham blower, with 6 inch connections, whereby a regular pressure and volume of air is obtained, and regulated by a blow-off pipe or vent with an air valve or check, which blows off when the pressure is in excess of that required. The vents are also used so that when shutting off the blasts they obviate the necessity of shutting down the engine or blower. I may as well add here that the same engine furnishes power for both blower and exhauster, which are connected on the same shaft.

After blowing up a heat, steam is admitted either from the top or bottom of the generator. The runs are generally made alternately, thus obtaining the best results from the heats and fuel. After the decomposition of steam takes place, the gas is carried to a scrubber, thence to the hydrogen holder. The water gas is then taken from the holder to the illuminators, where it comes in contact with naphtha vapors. The naphtha is vaporized by steam coils, six in number, at a temperature of from 230° to 260° F. The naphtha is continually dripping in pans, which are in close connection with the steam coils. A valve with a graduated scale is placed on the naphtha supply to the illuminators, thus to enable the operator to regulate the flow of naphtha as is desired. The mechanical gas is taken from the illuminators to a through bench of 2's, 18 feet long by 14 by 26 inches. The gas inlet to each retort is controlled by a valve near the mouthpiece, thus regulating the amount of gas to be permanently fixed by the heats of the retorts as one or the other may have a variation in temperature. The same degree of heat is used in fixing the mechanical gas as is used in coal gas benches. There are three test lights placed in a position for the operator to ascertain the quality of the gas as it advances in the different stages of manufacture, one taken from the main before the gas enters the illuminators, burning water gas or hydrogen, one after it leaves the illuminators to ascertain the luminosity of the light desired, and one from the hydraulic main after it becomes a fixed gas. Small test holes are placed in the retort lids to enable the operator to ascertain if the gas is permanently fixed, after which the fixed gas is drawn through the retorts by a Wilbraham exhauster. As there is no variation in the speed of the engine, the gas pumped by the exhauster is regulated by a bye-pass and valve connected with a Huntoon governor or float, counter balanced so that in case of a vacuum on the retorts the bye-pass valve opens, allowing sufficient gas to flow back to be repumped, so as to maintain the pressure or vacuum desired. After it leaves the exhauster the gas then proceeds through the same mode of purifying as coal gas, excepting there is no scrubbing to be done, but passes from the exhauster to the condenser, purifying boxes, station meter, thence to the commercial holder. The apparatus is so constructed and arranged that a duplicate set can be put in, doubling its capacity if necessary.

This brief description of the Wilkinson process will enable those who are not fully acquainted with it to form a fair idea of the mode of operating, and the construction of the apparatus. This plant was erected one year before I took charge at Uniontown. It was, as I have understood, the intention of the Company to use the hydrogen generator to make a straight water gas for fuel purposes, by having a hydrogen holder of sufficient size and capacity to furnish it in case the supply of natural gas should diminish or cease to exist, and to take from the same holder sufficient water gas, to be made as an illuminant under the same process as has been described. Whether this would be successful as a fuel gas I am unable to answer, but my judgment in the matter is, it would not be practicable. As this is a question new to me, I cannot discuss its possibilities.

In speaking of the Wilkinson process for illuminating purposes alone for small works, I am able to say a word or two on that subject. It will be seen in the course of my remarks why the Wilkinson process is not an economical one for small works. When I say small works I include all works with an annual output of 15,000,000 feet or less. The works at Uniontown is one coming under that head, with an average daily output of 20,000 cubic feet.

We may practically divide the Wilkinson process into three parts.

First, that of the separate generation of water gas; second, vaporizing the naphtha; third, fixing the gas.

With the first division we find that in blowing up a heat in a generator the waste gases and heats are not utilized, but pass out never to be recovered. It is needless to say that were it possible to regain a part or all of the waste gases from the hydrogen generator, by so constructing it as to utilize them under the bench of retorts, or for the generation of steam in the boiler, it would be an item to reduce the cost of manufac turing the gas, and also one to be recognized by a small plant operating such a process. But as such is not the case, we must admit that a valuable product which could be utilized in the manufacture of the gas is wasted.

Second. The objection of using naphtha, which is more expensive than crude oil, and also the expense of vaporizing it. Vaporizing the naphtha in a separate apparatus is a novel method, and it can be said that the control of the composition of mechanical gas can be better governed and regulated by that mode than by any other way known. Crude oil cannot be used in the manufacture of gas by the above process, but it necessitates the using of naphtha of a specific gravity of 65° to 70°. In using steam for vaporizing the naphtha it makes a small show on the fuel, as regards its consumption. While it may be a fractional expense, all of us who are experienced in the management of small works know it is classed as one of those matters that we may pay the least attention to.

Third. The firing of the bench. This is the most expensive feature of the Wilkinson process in a small works, not only on account of fuel, but of additional expense for labor. By coal gas men it is easily understood what attention is required of a bench; although there is no charging of the retorts, nevertheless it necessitates having additional labor to maintain the heats. And, again, we do not derive the benefit of the fuel and labor thus applied, at all times, on account of making all our gas in 6 to 7 hours. With the same bench, enough coal gas could be produced to supply the demand without the additional expense of running, and the amount invested in, the other apparatus which we have as a part of the process. The retorts which we have in our fixing bench at Uniontown are sufficiently large to produce 24,000 cubic feet of coal gas per day. Allowing 450 pounds to each retort, two retorts burning off in 4 hours, using 540 pounds of coal per day with an average yield of 4.50 cubic feet per pound, would make a total of 24,000 cubic feet.

It will be seen that this would be a sufficient quantity of gas to be equal to our necessities.

We have this bench also arranged with fittings for making an oil gas, if necessary, by having a ¾ inch pipe running through the mouthpiece to the inside, where a 4 by 4 by ¾ T is connected onto it. A 4 inch pipe is screwed into the T running the full length of the retort, where the oil passes through to the end of the 4 inch pipe back again to the standpipe, and out to the hydraulic main, etc. The oil, traveling a distance of 30 feet of straight heating surface, is generated into a rich hydrocarbon gas. By a mixture of air it makes a fair gas for commercial purposes, but smokes badly in a slight current of air.

With these facts before us, and comparing them with the results of water gas processes of the cupola type, it will be plainly understood by those who are practical in gas manufacture why the Wilkinson process is not an economical one for small works, without any further remarks or figures.

Before the erection of the Wilkinson process at Uniontown, the manufacture of gas was dependent on a McKay-Critchlow apparatus for carbureting natural gas. It was necessary to discontinue the use of natural gas on account of its weak pressure, and we now use steam in its place. We are still using the same apparatus and are getting good results from it, considering the type of the apparatus, and the purposes of its original construction, that of carbureting natural gas. We find a large percentage of CO_2 in the gas, on account of the insufficient depth of the generator. We also lack superheating capacity, but still we are able to make a good quality of gas.

In concluding my remarks, I must confess that I regret that we have not the output that would justify us in operating the Wilkinson, on account of the simplicity of handling the apparatus, and the control of the gas in its different stages of manufacture, etc. These are commendable features in favor of that type of apparatus. While the Wilkinson process has no place in small works, it can be said that where a works' output is sufficiently large, and which would demand additional apparatus to supply its consumers, I honestly believe the Wilkinson process is the one that would prove satisfactory in such places. In a small gas plant of to day great economy must prevail, as we have with us a competitor in the form of electric light. Look back some 12 to 15 years and compare the cost of manufacturing gas at that time with its cost to day; what a great lessening in that line? The question with us to-day is, "Has the cost of manufacturing gas been reduced to its minimum?"

In adopting any process for the manufacture of gas in a small plant, the process must not only be judged by the quality of gas made by it, but also by the space you have and what is required for cost of labor in operating. Holder capacity, cost of naphtha or crude oil, delivered, cost of coal or coke, cost of maintenance, first cost of such process, and other matters which it would be an advantage to take under consideration if such adoption is contemplated. The efficiency of the Wilkinson process in large works has been proven. This is evident by the erection and continued operation of the several plants in the cities mentioned in the beginning of my paper. These works are in charge of the best gas engineers in the country to-day, and it is needless to say that had the process proven otherwise than economical, it would have been speedily discarded by them. I have also understood that a plant has been erected at Milwaukee, Wis. The candle power of the gas manufactured by the Wilkinson process can be maintained from 25 to 30, without smoking, and it cannot be surpassed, if equaled, by any water gas process of to-day in that respect.

Without any further remarks, the difference between the Wilkinson process and that of the cupola type will be readily seen; and while I have tried to show why the Wilkinson process is not an economical one for small works, I may as well add that a process of the cupola system of water gas would prove more economical than the former in a small works. While we still have the Wilkinson process at Uniontown, and as our output is on the increase, I firmly believe that the time will not be long when it will be sufficiently large to justify us in operating the plant.

Having been asked a civil question, which is the subject of this paper, I have tried to give it a civil answer, without casting any reflections in any way, and if my paper has shown that the question has been treated with civility and answered, then the writer's object has been accomplished.

Discussion.

Mr. Miller—Mr. Seamon speaks of the fact that the labor and fuel accounts are high, and he can use only naphtha, and yet he seems to think it would be more economical for a large works. I do not quite see why these things are not equally objectionable in large works as in small works. The only advantage I can see that he claims for it is the fact that it will maintain a high and uniform candle power. I would like to ask Mr. Seamon if the works of the generator-superheater types will not do the same thing, and run economically?

Mr. Seamon—From what I have read upon the subject, they can bring the candle power up to that standard, but cannot surpass it. With reference to your suggestion about the same thing applying to large plants, it would be necessary for those who are operating large plants to have had some experience in the small plants. They would then know that every dollar expended would be about the size of a cart wheel in a small plant, and very small in a large plant. I have had a little experience at the works at Wheeling, W. Va. This plant has an output of about 135 millions per annum, and I find, from the little experience I had there, that a dollar spent at a works of that size, while it is a dollar of course, would be regarded differently from one spent by a small plant. In a small plant we have to watch everything very closely. It is the small items we have to look after.

Mr. Miller—I think Mr. Seamon has rather a wrong idea of the method of procedure in large works. A good engineer starts out to make a plant that will do the best work. The first cost of the plant may not always be considered, but the expense of working the plant and the results are what he is looking after. And if he gets a plant the operation of which will cost him more than in any other form, and in which he is getting no better results, he is not going to adopt that plant just because he can waste a little money in it. And I do not quite see yet what Mr. Seamon recognizes as the merits of a plant that requires two or three operations and three different sources of heat to do a thing which he says can be accomplished by one operation and by one source of heat.

Mr. Seamon—I have given in the beginning of my paper the names of several cities where plants of the same type were erected, and I have read the reports and claims of the engineers of those plants. They are capable of answering these questions better than I. They are still operating under that process, and it proves economical for them. It is a question of whether, when working in any other way, it will prove satisfactory. It is the large output that lessens the cost.

Mr. Miller—Can Mr. Seamon tell me whether any of these companies that have put in these plants, large or small, have ever used a modern

generator superheating apparatus? Or does he know that Chicago, which has used both, has abandoned the superheater process, which is the same, or practically the same, as Wilkinson's? And does he know that the last contract let by the Consolidated Gas Company of New York was for a 7½ million plant built upon the improved generator-superheater process, after having tried Wilkinson's, or the Tessie Du Motay process, for a number of years?

Mr. Seamon—Are those facts that you have stated?

Mr. Miller—Yes, sir.

Mr. Seamon—I was not aware of them.

Mr. Gwynn—Do you know how much naphtha you use per 1,000 feet for enriching?

Mr. Seamon—I have not operated the Wilkinson process myself, because it has not been started since I went to Uniontown. But from figures, I would say that the amount of gas sent out in April, 1890, was about 300,000 cubic feet, and the average amount of naphtha used was 8 gallons per 1,000 feet. The process has only been operated three months at Uniontown.

Mr. Gwynn—What was the candle power of the gas you made?

Mr. Seamon—I could not say what the candle power was; no record was made of that.

Mr. Shelton—I would like to make a brief statement, and I do it with diffidence because I am connected with interests which may be said to be antagonistic, yet I do not want a paper read before the Ohio Association to go on record, indicating as an arbitrary fact as stated here, or certainly to be inferred from what is stated, that the best gas managers confine themselves to the Wilkinson process as the best even for large works. I think the paper pretty thoroughly disposes of the question so far as the small works are concerned, and I would also apply it to large works. I think a very good evidence of this is that a large plant of 24,000,000 per day capacity has abandoned that process—the plant which our President referred to in his address to-day. It has been engineered, fostered and brought to the point of partial completion at this time for supplying New York City, and which will, to a large extent, supplant the gas made on the system of the Wilkinson, the Tessie du Motay and the Jerzmanowski processes, and other types similar to the Wilkinson process; and the plans of that plant of 24,000,000 capacity, which are now being constructed, were not determined upon until a very careful examination by the promoter of that gigantic enterprise, Mr. Emerson McMillin, of whom I don't need to speak more to this Association. The position finally reached was adverse to the Wilkinson and similar types as to the process to go in there. The inference exists from this paper that larger works should adopt the process mentioned, and it is only fair to also have some of these facts presented which Mr. Miller has mentioned, and in connection with this largest gas undertaking in the United States.

A vote of thanks was given Mr. Seamon for his paper.

Mr. G. A. Allen, of Zanesville, O., then read the following paper:

DISCRIMINATION BY GAS COMPANIES IN THE TREATMENT OF THEIR CONSUMERS.

While the gas business has its peculiarities, so has every other line of trade, and though those peculiarities need to be considered, yet the same general business principles are as applicable to the gas industry as to the manufacture and sale of any other commodity.

In all manufacturing enterprises there are two distinct branches—the making of the goods and the selling of the same at a fair profit—and one is as important as the other. In order to obtain a profitable trade and hold it, it is necessary that the quality of the goods be satisfactory to the purchaser; the price must be such as to commend itself as not being exorbitant, and those to whom is entrusted the duty of disposing of the goods must exercise such tact and good judgment that customers will give them the preference in making purchases, other things being equal. In our own business, generally speaking, the first two requirements are well complied with, and while all aim to fulfill the latter, there are some questions arising, and differences of opinion existing as to the policy best to be pursued; and among them one of the most important is discrimination in the treatment of consumers.

The American people, our customers, are too intelligent to be misled for any great length of time. At the same time they are willing to do what is right, and will sustain any public business or company that will conduct its affairs on the principles of right and justice. But it will not answer that the company knows it is doing right—care and time and energy must be expended in explaining and convincing the people of that fact. If it is right and just to discriminate between consumers, the public will stand by us in so doing, provided we take the trouble to show the justice of our doings; if it is not right, no such discrimination should be made. If there is to be no discrimination, then all must pay exactly the same price per 1,000, regardless of amount consumed, at what time or for what purpose; the man who buys a million a month to use for mechanical purposes must pay the same rate as one who uses 100 feet for lighting use. Is this right or just? It would be discriminating to allow a rebate to one, a large consumer, while the same percentage of rebate was not given to another who was a small consumer. Some would say the small consumer's money is just as good or valuable as that of the larger one. True, dollar for dollar, it is, but it takes just as much machinery to make the gas used by the one as the other; just as much time and clerical work to collect the small consumer's dollar as it does to do the same for $100 worth of gas for the larger one. Again, an investment of $75 for meter and service will be ample to supply the gas for the $100 consumer, while an outlay of not less than $1,300 will be required for meters and services to supply the 100 consumers, burning but 1,000 feet per month each. This as interest alone would be equal to a difference of nearly $75 per annum on the two investments, which would justify the allowance of 6½ cents per 1,000 feet in favor of the larger consumer. This certainly would not be considered an unjust discrimination, but to allow one to have his gas for less money, merely for the purpose of holding his business, when the conditions are alike, would be unjust, nor could it be considered as doing business on correct business principles.

The interest of the gas company and its consumers is identical. Whatever tends to reduce the cost of manufacture tends also to reduce the cost to consumers. It is probable that if the price to the manufacturer who needs a large amount of gas for mechanical purposes is the same as is necessary to charge the small consumer, the former will not make the purchase; while at a reduced rate he could afford to and would use the gas at a price affording some profit to the company, and at the same time the tendency would be to reduce the cost of manufacture, thus benefiting all consumers. The same might be said in regard to gas engines, stoves, laundries, etc. The gas being used in daytime, we have it to spare, and though it be sold at reduced rates, we are by this means able to secure a class of consumers we could not otherwise obtain; the cost of manufacture and delivery being reduced, we are able to furnish gas to all consumers at a less rate per 1,000.

The gas stove branch of our business is deserving of special mention. In starting the demand for stoves in a community it is impossible to convince people by talk or argument that gas stoves are as good, cheap and desirable as we know and represent them to be. We must, in some manner, make practical demonstration of the facts. Concessions must be made. Why not, following the example of the successful managers of other lines of business, who give extra bargains "for this day only," advertise our willingness to sell stoves at cost and charge nothing for settings for a certain specified time? It will start the sale, and in a short time the superiority of gas for cooking purposes will have been conceded by the public. Then make a charge for future settings, and a profit on the stoves if thought advisable. This might be called a discrimination; but it is right, and the people would sustain us in so doing.

A set of rules governing the sale of gas and setting forth on what terms and under what conditions the gas company will supply gas, can be rigidly adhered to only because the company, from the nature of its business, is, to a considerable extent at least, a monopoly. Should such an idea be adopted, consumers, instead of seeing in such dealing a desire to treat all alike exactly alike, would immediately conclude that the company was taking advantage of its position; they knowing that no institution with active competition would think of attempting to transact business in such a manner. The theory that a gas company has but one consumer—the public—is a beautiful success, as a theory; but an attempt to put it into practice would probably detract very much from its beauty. Owing to the fact that ordinarily there is but one gas company in a community, the public is not slow to accuse it of taking advantage of its position when it adopts arbitrary and unusual methods. Rules founded on correct business principles should be adopted and adhered to as closely as circumstances will permit; and in case, under peculiar circumstances it is deemed to the best interest of all concerned to make a concession, let it be done only when it seems right and just to all; and should objection be raised by anyone, the reason should be carefully explained and the complainant given to understand that under like conditions the same favor would be extended to others.

It is impossible to pursue any policy in any undertaking that will please everybody. Notwithstanding we have the best and cheapest artificial light made, yet, in spite of all our persuasions, there are still to be found in every community a few people who will persist in using an inferior, troublesome, uncertain light, under the mistaken impression that it is a little cheaper than gas, or because they don't like the gas company.

If we are correct in our method of dealing with the public, if all are treated with justice and fairness, the use of gas for light, fuel and mechanical purposes is bound to attain such proportions as was never heretofore dreamed of even by the most sanguine.

Discussion.

The President—This subject, gentlemen, is a matter which is not limited in its application. It strikes you all alike, and it is an important one, and should call up profitable discussion and the experience of everyone present. We would be very glad to hear from the Secretary on this subject.

The Secretary—Mr. Allen's paper says nothing, or at least very little, about any other form of discrimination than that which pertains to discrimination in the rates and price of gas, and while that is the usual way in which discriminations are made, yet there are other means of discrimination than that. For instance, the Columbus Gas Company, in its zeal to obtain a few more consumers, sent out a solicitor authorizing him, if he could get an electric light consumer back thereby, to make a little concession in the way of giving him Lungren lamps in his store free of rental. He was instructed to make the concession quietly, without announcing it generally. As a result we got several electric light consumers back without much trouble. However it was not long until we found that we had gotten ourselves into hot water. Some of our consumers who were paying the rental of 25 cents a month each for their Lungren lamps heard of this concession which we had made, and objected. They said, "If anybody is entitled to Lungren lamps free of rental, it is your old friend, who has stood by you during all these years and has not forsaken you for electricity; and yet you have made a concession to him that you will not grant us. He gets his Lungren lamps for nothing, while we have to pay a rental." Well, that struck us as being a very just position, and we acknowledged that we were trying to get consumers back by making that concession; but we stopped making it. Then, again, in the way of doing piping. We found several small buildings, dwelling houses particularly, the owners of which said they would use gas instead of oil if they could get their houses piped at a reasonable figure; but they had asked for estimates from plumbers, and on those estimates they couldn't afford to have their houses piped. On investigating we found that we could do the piping without loss at a much less figure, and offered to do it, and did do it, in a few cases. But it was not long until we found that we were going to have trouble on that score; others came to us to pipe their houses, saying they would use gas if we would pipe them at cost. We soon found we would have to go into the general gas fitting business, at cost, if we wished to be consistent and not discriminate. I simply mention these instances to show that there are other means of discrimination besides charging different rates for gas. I believe that gas companies, especially in large places (and I don't see why it is not equally true in small places), should adopt fixed rules and rates and adhere to them under all circumstances. I do not see why they are not under obligations to do this. I think they should have a fixed rule with reference to the rental of Lungren lamps, the sale of gas stoves, prices and rates on everything, gas included; that you should not allow one customer to have Lungren lamps free of rental, for instance, unless you are willing to allow every other customer to have them upon the same plan. That may be rather broad, but as a general principle I believe it is true.

Mr. Allen—So far as the Lungren lamps are concerned, we thought they were a pretty good thing at first, and bought some of them. We were anxious to have them tried, and put them up where our consumers wanted them, but we never have bought any more and we never have charged any rental for those. If other people wanted lamps they bought them and put them up, and when we have any lamps that are not in use, we will set them up for anybody that wants them, and we never have had any trouble about it at all. I agree with Mr. Butterworth that while this paper don't treat of all of these subjects, the same principle will apply to them as to the charge for gas. Identically the same business principles should be applied in selling gas and the handling of gas consumers as are applied in any other lines of business.

Mr. Starr—The question of the treatment of gas consumers is a very important one. They stand in a different light to gas companies from that of the purchasers of any other kind of goods. With any other kind of goods they can go to the store and examine the goods, see them measured off and know what they are getting; but with the gas consumer, not one in 50 can read a meter. They do not understand the reason why bills increase in the fall and decrease in the spring. I find it is a good plan for your clerks in the gas office to be polite. Electricity has caused them to be more polite than they used to be. Coal oil also has caused them to be more polite. That is one of the blessings of electricity and coal oil, they have taught politeness on the part of the clerks in the gas office, and that is about the only blessing there is in them. We make out about 20,000 bills a year, and we make perhaps a dozen or twenty mistakes in a year reading meters ourselves. It was only a week ago that a man came into my office and said, "Starr, look here, my bill was $1.80 this month and only 70 cts. last month." Said I, "The light is all right." "He said, "Yes." "Well," said I, "If we had it too little last month and too big this month next month will make it all right." He answered "I guess it will," and went away perfectly satisfied. But the main thing in giving satisfaction to consumers is to furnish them a good article of gas at a moderate price. If you furnish them with good gas, and, as I have often said before, give them big burners, you will have a good bill, and they will be pleased with the light. This is the key to the situation. I used to go upon the plan of a little burner and a high price, and the consumers got along the best they could. When their bills came in they did not like them and the light did not satisfy them. Then I reduced the price of gas, from $1.80 to $1.60, and told them I could not afford to sell it for that price if they used those little burners, and I began putting on big burners, burners which would burn 5, 6, 7, and 8 feet. I furnished them with large burners and good gas and had infinitely less complaint than I used to have with small burners and poor—well it was good gas then; it was all good gas. (Laughter.) A small burner was the practice then; but I have found if you give the consumers good gas and a big burner they appreciate the light and are willing to pay for it. Our gas business was never so pleasantly conducted as now, and with so little complaint. If we find a consumer who is dissatisfied, we get the statement book right out and look at it to see if we have not made some mistake that we can explain to him. I have one clerk who is old and don't believe in it, and he frequently gets into trouble. Treat your customers as if you valued their custom and you will *have no* trouble.

The Secretary—Mr. Starr's remarks are very good, as they always are; but I don't know that he quite explained which side of this question of discrimination he stands on—whether the gas company should discriminate or not. Do you say to one consumer, "Here, you can have these Lungren lamps for nothing, if you will take six," and to another man, "You can have three if you will pay a rental of 25 cents a month apiece?" Do you do anything of that sort?

Mr. Starr—Not at all. We sell to all for the same price, except for gas engines. We get $1.20 for all kind of uses, except for gas engines; and what they use in the day time we furnish for a dollar.

A Member—How about cooking stoves?

Mr. Starr—Ah, they have vanished. They introduced natural gas into our town two or three years ago and cook stoves went their way. I used to have 600 running. I was a pioneer in the cook stove business, but I don't suppose there are 50 in the town now.

Mr. Clapp—As I look at the law I would not understand that discrimination meant that you were to sell gas or furnish lamps to all people at the same figures. Say, for instance, you had a scale of prices, and all consumers using so much gas would get it at the same price—I would not consider that discriminating. I think it is wrong to discriminate. At the same time I think any gas manager will try to run his business to the best interests of his company, and if he knew it was not to his best interest to discriminate, as is mentioned here by scaling prices, I do not think it would be done. However, that is a matter I think all managers must determine for themselves. I certainly could not run a gas works successfully in our town without scaling prices, because we have some very large consumers, and we must depend on the large consumers for our success in business.

Mr. Gwynn—When you speak of scaling prices, don't you publish your rates so that the consumer is advised that by buying so many 1000 feet per month he gets such and such a rate, and everybody knows of it.

Mr. Clapp—Yes, sir; it is published on each bill.

Mr. Coombs—If gas was rated at a uniform price and there was

no discrimination made in that way, wouldn't there, in fact, be a discrimination when it was sold to both large and small consumers at one price? It seems to me there would be discrimination one way or the other.

The Secretary—You mean that the consumer of a large quantity of gas would be discriminated against if he had to pay the same price per 1000 feet as the small consumer.

Mr. Coombs—Yes, sir; it would be a discrimination against the large consumer.

Mr. Shelton—This question of discrimination is one which is brought up and discussed at the four conventions which meet every year, but I do not think it has been settled yet; and, moreover, I do not think it will be until the next century.

Mr. Gwynn—We have three rates on gas. Anybody consuming 5000 feet or under per month pays $1.50; over 5000 and under 10,000, $1.35; and 10,000 and above, $1.20, less 10 per cent., if paid on or before the 15th at the office. That makes our net rates $1.35, $1.22, and $1.08. Those rates have been in force 3 years this coming April, and there has not been a single instance, to my knowledge, where we have had any fault found on account of discrimination. The rate is published and everybody knows what it is, and whenever anybody burns a sufficient amount to entitle him to a reduced rate he gets that rate. It works very satisfactorily with us and it is the only discrimination, if you call it such, that we practice. So far as meters are concerned and running services into a man's place of business or residence, we do that free of charge, whether the building is on the lot line or set back in the lot. We treat them all alike, run the service in and set the meter. But so far as putting on special burners or furnishing lamps to one consumer and not to another, we do not do it.

Mr. Donald McDonald—I would like to ask Mr. Gwynn what he does in the case of the man who burns almost enough gas to come within the $1.22 rate? In other words, the man who, if he had burnt a few more feet of gas, would have had a smaller bill than he did have as it was?

Mr. Gwynn—Yes, we have a few of those cases; but I will tell you what we then do. If he registers 9,900 or anything over that and under 10,000, we take the register at 10,000. We instruct our clerks before they book that reading to make it 10,000, and we have no further trouble with it.

Mr. Donald McDonald—Do you publish rules such as that?

Mr. Gwynn - No, it would be pretty hard to explain it so far as that is concerned; it would take a good deal of trouble to do it. We publish the rules, the prices and the terms of payment; and we are very strict about the terms of payment. If you came into our office on the morning of the 16th and tendered us the rate, less the 10 per cent., you would be refused every time, and if you don't pay the full amount we will shut your gas off. There is another rule that we do publish, and that is where the 15th comes on Sunday they have until the night of the 16th to pay their bills. We do not take advantage of Sunday, Saturday being a busy day, but we give them until the night of the 16th, when the 15th falls on Sunday.

Mr. Hurlburt - With the beginning of 1892 we adopted a uniform scale, and we find it is very much more satisfactory in dealing with our customers. We had a good deal of trouble with the sliding scale. We had some consumers who claimed that their average, taking the year through, would entitle them to a lower price than they were given, and for that reason they should have the low price all the time. The only trouble with the uniform price is with very large consumers. We have one or two very large consumers and the only way we could prevent complaint from them was by having them read their own meters. After they read their own meters they did not complain.

Mr. Milne—We have a sliding scale of prices at Marietta, and like it very much. We have no trouble. I do not believe there is a gas plant in the State of Ohio that is run with any less friction.

Mr. Gwynn—One of our rules, on the back of our bills, is not to allow consumers to add bills together. For instance where two meters are in one name, we do not allow the consumers, by adding the bills together, to take advantage of the discount. Every meter which is set we term a consumer.

Mr. Faben—Under the law of Ohio a City Council is vested with the power to fix the maximum price a gas company may charge. That law, of course, is not in force in every town, but I would like to know if this sliding scale which has been described here to-day was the result of a price fixed by the Council or one adopted by the company without the consent of the Council.

Mr. Gwynn—In reply to that I would say that our rates were not fixed by Council. I understand that is the law, because I have been through it before; but the sliding scale I spoke of was fixed when we had a contract at $1.50 per 1000. That contract did not expire for two years to come, but we reduced the price before it expired, and we have never heard anything from the Council. The contract expired over two years ago, but they have never said anything.

Mr. Stephens—Under the laws of Ohio I would like to ask whether they can make discrimination in the selling price of gas.

Mr. Faben—I could not answer that question. I know, however, it is a fact that the law speaks of a maximum price, but it does not say that they shall not sell for a less price.

Mr. Allen—I would state that, just within a day or two—I presume the same law would apply to water rates as to gas rates so far as that is concerned—we have had a lawsuit with reference to water rates, and the judge in rendering his decision held that the Board may fix one price for the small consumer and another for the large one, and that it may, under special circumstances, make special rates if it chooses. I am no lawyer, but I know that was the decision in the water works case.

Mr. Stephens—I know of a case decided to the effect that the gas which a company sold in the day time was an extra production, and the judge's ruling was that that could be sold at any price the company saw fit, but that gas sold at night was another thing, for that was sold under their charter. I asked this question for information; I did not know what the law of this State was on that subject.

Mr. Faben—I would like to ask if the case you have just referred to was in Ohio?

Mr. Stephens—Yes, sir.

Mr. Clapp—In reference to Mr. Faben's question in regard to scaling prices and the rights of the Council in the matter, I would state that our Council fixed the price of gas at a maximum rate of $1.50 per 1000, but we were more liberal than the Council and scaled it from that price. The price, as fixed by the Council, still stands at $1.50.

The Secretary—For the benefit of gas companies that believe in a sliding scale, I will state I have just learned of a sliding scale adopted by a waterworks, under which the objection that has been urged here, that the man who would burn a little more gas would pay less for for it than if he had burned a little less, would be obviated. The arrangement is this, to illustrate it: For every 1000 gallons of water under 10,000 gallons, the price is 10 cents a 1000; for every 1000 gallons above 10,000 the price is 8 cents for the additional thousands; and the price on every extra 1000 above 20,000 is 6 cents per 1000 gallons; and so on. For instance, a person using 10,000 gallons of water would pay 10 cents a 1000 gallons for it; and the person using 20,000 gallons would pay 10 cents a 1000 for the first 10,000 and then at the rate of 8 cents a 1000 for each 1000 gallons above that; or if a person used 30,000 gallons or more, he would pay 10 cents per 1000 for the first 10,000, and 8 cents per 1000 for the next 10,000, or 18 cents for the first 20,000, and then a rate of 6 cents per 1000 for each 1000 gallons over that amount. That would do away entirely with the possibility of a man, by using a little more water, paying less for it than if he had used a little less. The same plan, of course, could be applied to a sliding scale for gas.

Mr. Greenough—I think there is a good deal to be said on both sides of the question. I think that the discrimination, which is really no discrimination, of making a sliding scale in proportion to the quantity of gas consumed, is a perfectly fair thing to do. I do not believe, however, in large companies making a different rate for gas used in an engine and for fuel than they do for illuminating gas. A small company may have to do it sometimes, but I do not believe in the practice, as a general principle. I believe that gas is made for illuminating purposes, and the man who uses it for the purposes for which it is made is the man entitled to the first consideration, and that no man ought to get gas cheaper than the man who uses it for illuminating purposes. But I do certainly believe in small companies making a difference in rate to encourage large consumers to use your gas, where you are unable to sell it to everybody at a price which would make the large consumer use it anyway. In Boston we never made a different rate to anybody, except for very large consumers, and if a man used so much gas, at the end of the year he got a slight discount on his year's bills, which we paid back to him at that time. I know from the experience which I have had in small towns that you cannot use the same rule for every company; and where a com-

pany is subjected to very sharp competition in the smaller cities, it has to adopt a rule that will give to it the business, anyhow. So I do not think a general rule can be laid down which would apply in each instance.

Mr. McIlhenny—I have never had any practical contact with gas consumers, but it would seem to me to be just as the last, and other speakers, have said, that no positive rule can be laid down to govern both the large and the small place, and the large and the small consumer. Local circumstances must be taken into account, and the business principles which apply to business in the every-day world can also, to a very great extent, be applied to the gas business. Anything by which the gas manager can honorably increase the sale of gas should be resorted to.

Mr. Allen was then tendered a vote of thanks for his paper.

QUESTION BOX.

On motion the Question Box was taken up.

The President—The First question is, "Does it pay gas companies to rent gas stoves?"

Mr. Penn—My plan is to try and sell them first. If you cannot sell them, or have any second hand ones that you can't sell easily, rent them. Of course, in a town where you are introducing them, if you cannot possibly sell the stoves, I would recommend renting them. I rent stoves at 25 cents per month, and I believe it pays, especially to introduce them; but as to making it a business, I doubt very much whether it would pay. I think the best way is to hold out inducements to get them to buy them. When they become interested in them and use them more freely, then endeavor to sell instead of rent.

Mr. Nash—25 cents for a stove, regardless of the size of the stove?

Mr. Penn—Yes, sir; don't make any difference as to the size, 25 cents.

Mr. Jones—This is a hard question to answer, as it depends on what rent you get for the stove and what the consumer will burn. But I think, take it as a rule, it does pay, for it increases your day consumption, and that is what we want. We have about 300 stoves that we rent for $3 a year, and that about pays for the repairs on the stoves and the trouble of setting them up. I think it does certainly pay.

The Secretary—It seems to me that the great majority of us believe it would pay; if there is any man here who doesn't think so, I would like to hear his reasons.

Mr. Douglas—One objection to renting them would be this: everybody that rents a stove wants a new one, and you will soon have a lot of stoves on your hands that you can't rent.

Mr. Penn—That is not the case, at least; down in our portion of the State. Our people will take a second-hand stove, and don't object to them. Of course, we put them in good shape. I have never had any trouble in renting the stoves yet, but I find it difficult to sell a second-hand stove, unless I sell it at a very low price. If you can't sell the stoves, rent them by all means.

Mr. Tayler—The only objection I have to the renting of stoves is that the 25 cents a month will not much more than pay for the repairs, and you soon find that you have a great deal invested in old stoves. Finally the old stoves get out of repair and better stoves come into the market, and it seems to me it would scarcely pay in the long run. But where you can't do better, you had better rent them rather than lose the business entirely. Our plan is to furnish stoves free of charge. That is, we are willing to set up the stove, together with everything with it, and the consumer can use it 3 or 4 or 6 months, if he wants to, and then, if he is not satisfied, we will take it out, and it don't cost him anything, except for the gas it burns. If it proves satisfactory, then he buys the stove; and I can say this, that we have never taken one out.

Mr. Nash—Do I understand you to say that you sell the stoves?

Mr. Tayler—Finally, we sell them; yes.

Mr. Nash—I would just add we try to do that. We try to get cost price, but not to make any profit. We do not charge for running a little extra pipe and setting a meter, but we try to get the cost of the stove in the first place.

Mr. Dittmar—There seem to be a great many here of the opinion that it pays to rent gas stoves. Now, it may pay; that I do not know. I have had no experience in that direction. My opinion is that when a person can get a stove for 25 cents a month, or $3 a year, it is cheaper for him to rent a stove than it is to buy it. Why? That stove will last but a few years, with the care that is usually given them in the kitchen. In the first place, they don't take care of them as they would of their own stoves. If they have a stove of their own they will care for it and look after it. The stove soon gets out of repair, then they send to the gas office for somebody to fix it, and you must go there to repair it and take care of it. My opinion is that it will cost more than 25 cents a month to care for the stove and keep it in running order. If I were in the business, to let or sell gas stoves, I would say sell them; I would much rather do that than rent them.

Mr. Penn—I would like to ask Mr. Dittmar if he was selling stoves and had a customer who had a stove that was out of repair, would he send a man to repair it; and if he did, would he charge him for it?

Mr. Dittmar—Certainly; if I sold him a gas stove and it got out of repair I would expect him to pay for the repairing of it.

Mr. Penn—We do not do that. We are so anxious to get their trade that we will repair it, take it down to the office, clean it for them, repair it and set it up free of charge. We are so anxious to get them to use our gas that we do not charge them, and we think it will pay us to do that.

Mr. Dittmar—It may be—I do not say anything to the contrary; but I say if I were a consumer in your town I would prefer to rent a stove rather than buy it, and I think it would pay me to do it.

Mr. Roper—I would like to have all of these gas men rent stoves. At Logan, Ohio, they made it a practice for several years to rent stoves, and I am satisfied they had more gas stoves in actual use than any other town in the United States in proportion to its size. The gas manager there said he rented them for $3 a year or 25 cents a month, but that he did not get $3 a year out of them. He received on an average from $1.50 to $1.75 or $2; that some of them would not run over 50 or 75 cents. He would rent them for three months and then have to take them out; and when he came to take that stove and put it back again in use it was in such condition that it cost him over $3 to put it in repair, and when the next customer came in and wanted a stove he did not want that stove because it had been in somebody else's house; and as he did not know who this somebody else was, would say "I do not know just what kind of a stove it is, but if you havn't got one a little newer than that I would not like to take it." They rented them for several years and then abandoned it, and when I was there some time ago the manager told me that the practice had proved very unsatisfactory.

The President—I will call on Mr. Greenough to answer Question No. 2., which reads: "If a gas company can buy nut coal at $1.30 delivered in their works, and can sell their entire coke product at 5 cents per bushel, net, would it be economy for them to use nut coal in their furnaces?"

Mr. Greenough—Why shouldn't it be economical? They are heating every retort in our old works to-day with coal. They sell the coke for more than the coal costs.

Mr. Gwynn—Will a ton of coal go as far as a ton of coke; or does it go farther?

Mr. Greenough—It goes farther.

Mr. Gwynn—There is no question that it would in that case.

The President—Question No. 3 is, "In transferring water gas from a relief holder by means of a steam jet exhauster, are stoppages of pipes likely to occur?" I will call on Mr. Shelton to respond to that question.

Mr. Shelton—May I imitate Mr. Greenough's example and answer the question by asking, why should they occur?

Mr. Gwynn—It is usually presumed, by a great many gas men at least who have used the steam jet exhauster, that the use of it produces naphthaline. I think perhaps that is why the question is asked. I ran a steam-jet exhauster about three years and had no trouble with naphthaline. I might have had a little trouble toward the latter part. The way I removed the naphthaline was with steam; cleaned it up with the steam. I think that is why the question is asked, but I do not believe they would be liable to stop the pipes if a steam-jet exhauster is used. I see no reason for it.

The President—I think likely the trouble from naphthaline has been attributed to the steam-jet exhauster. Whether it would be any more likely to occur with water gas than coal gas I could not say. I should not think it would, and I think the question of whether a steam-jet causes the naphthaline formation has been settled somewhat.

Mr. Shelton—I do not see why a steam jet exhauster should cause naphthaline any more in water gas than coal gas. I think they can be considered on a parity in that respect. I know in a number of cases in the manufacture of water gas the use of a steam-jet exhauster has occasioned no undue amount of trouble in this respect. I think the trouble must be due to local conditions that are not specially dependent upon the kind of gas made.

The President—Question No. 5 is: "What must be the relation between the price of crude oil and the price of coal or coke before it will pay to use the former as fuel under boilers?"

Mr. Miller—I never used any crude oil under boilers. I can say that a pound of oil has about 20,000 heat units and a pound of ordinary bituminous coal has about 15,000 heat units. In other words, there is about one-third more heat in a pound of oil than there is in a pound of coal. Crude oil weighs about 7 pounds to the gallon. Now the gentleman who is interested in this question can take those data and figure it out for himself. I can say, however, that oil can be applied more economically than coal. In burning coal in boilers it is necessary to use twice as much air as is necessary for burning oil, which is, of course, a great loss. In burning oil that is not necessary. The combustion can be made complete without this great excess of air; and in practice I believe they usually figure that about 150 gallons of oil will displace a ton of good coal.

Mr. Hayward—Does not the question of labor enter very largely into the calculation, as to the comparative expense of firing with oil and coal?

Mr. Miller—Yes, it would enter largely. I think the question of labor would enter very largely where you have a bench of boilers where you could economize to the best advantage; but with one boiler it would not make any difference. I made a very careful experiment some years ago, and I do not remember the exact figures except that oil at that time was 45 cents a barrel, of 42 gallons, and slack was $1.25 a ton. The result of the experiment showed that it was just about an even thing. There was very little economy in it except on the question of labor. There would be very little economy except in a set of boilers.

Mr. Nash—I have used petroleum tar under a boiler and found it

took about 4 barrels to equal a ton of coal. I understood that 3 would do it, but found that it took nearer to 4.

Mr. Penn—Did that include the leakage in unloading?

Mr. Nash—No; it was what was used actually under the boiler.

Mr. McIlhenny—Is there no place where oil is used under the boilers? If it has been found that oil is cheaper than coal, a number of places must be using it.

The Secretary—Mr. Faben uses crude oil under his boilers at Toledo, but he is not in the room at present to give us the benefit of his experience.

Mr. Penn—I was talking a short time ago to a gentleman that had burned crude oil under his boilers and made the comparison between coal and oil. He said that the Standard Oil Company, or the parties that furnished the oil, always regulated the price at which they would furnish oil according to the price of coal. So that it was just about an even thing, and the only question that entered into the subject was as to the matter of convenience. That is the understanding I have of it. I thought seriously of using it under my boilers, but I found that the price that they would put on oil at your station would be just in proportion to what your coal cost you.

Mr. Gwynn—My brother in Bucyrus used oil under a Babcock-Wilcox boiler for an electric light plant, and he informs me he found it but very little cheaper to use oil than coal, with coal at about $2.25 and oil 1¼ cents a gallon. He says it is a little cheaper, aside from the question of labor.

The President—I would like to ask the gentleman in what shape he gets his oil at 1¼ cents.

Mr. Gwynn—He gets it from the Standard Oil Company in tank cars, and it flows down through a pipe line into the storage tank.

A Member—If a person were less favorably situated he could hardly hope to get it that cheap.

Mr. Gwynn—But, on the other hand, he gets his coal cheap; he is on a good coal road.

Mr. Donald McDonald—I bought oil at 1¼ cents, and found it just about as cheap as coal at $1.60 per ton, and now that oil has been quoted me at 2¼ to 2½ cents a gallon I do not think of it any more. In other words crude oil seems to have gone up since then.

The President—Question No. 6 is:—"How can leaks in gas mains best be located?"

Mr. Printz—That same question has been answered several times at our Association meetings. Some would suggest one way and some another, but I think the general rule has been to take a bar and go down along the line and sink it at different places to discover where the gas would smell the strongest. I think that has been the universal rule.

Mr. Douglas—I took a piece of one-eighth pipe, put an atomizer on top of it, exhausted the air from the bottom of the hole and did not have to get down on the ground.

The President—Question No. 7 is:—"Which is the better plan, That gas companies should sell stoves and other gas appliances at cost, or that they should make special inducements to dealers to 'push' the sale thereof?"

Mr. Roper—I cannot give you personal experience on this subject, but I can tell you what others have told me. I might name a few towns possibly that would be a pretty good example. I know the gas company at Aurora, Ill., handled gas stoves, and sold at the rate of about 175 to 225 of them in one season. A year ago last summer they went out of the gas stove business, turning it over to the local dealers. The company set the stoves for nothing, ran the pipe, took the stoves from the dealers own store and agreed to set them up without any further expense to the dealers, but did not sell 50 stoves. Last year the gas company went back to it again and sold 175 stoves, and this year they have sold 400 heaters. That is the experience at Aurora, Ill. In our own town the gas company attempted to give it up, and even went further and offered a little more inducement and thought that they would create a little opposition among themselves, although they did not give up the sale of stoves. The result was that one hardware dealer sold 3 stoves and the balance of them sold none. So far as my observation goes that has been the result in each and every place where I have been. It has been found that the dealer did not care anything about the stove—all he cared about was his profits. The cheapest stove was the stove he wanted and he did not care anything about the balance. If anything went wrong, if the stove did not burn right, if the combustion was not right, the users call on the dealers, who would say "We do not know anything about it; the gas company is the one to look after it." The result was that the gas company had to do more work than before, and I guess that has been the experience in every town I have known of. The gas companies had to do a great deal more work where the dealer handled the stove than they did where they handled them themselves.

Mr. Prichard—We have always sold them ourselves and put them in. We have left some stoves with a few of the dealers at Portsmouth since I have been there, but I got there so late in the season that I could not tell much about it. I do not know how many were sold there this last season, but my opinion is that it is best for the gas company to handle the stoves,

A Member—I would like to ask if anyone knows of a gas company that sells gas stoves at a profit, or tries to sell them at a profit?

Mr. Roper—Yes, I know of several gas companies who sell stoves at a profit. I know where gas companies are selling stoves at a profit, and sell just as many as gas companies selling them at cost, and at the same time the dealers do not do any business at all. The gas companies have taken hold of it, have pushed it, have carried the price up and have gotten their price right along. They have done the piping and set the stoves and the consumers paid no attention to it. I will say that at Aurora, which I have already referred to, heating stoves were sold at a profit all through the fall and winter. On an 18 inch oven, four-hole stove, without the item of freight, they make $6.

The Association then adjourned until 9 o'clock A. M., March 16th, 1893.

SECOND DAY—MORNING SESSION.

After calling the Association to order, President Welch asked for the report of the Committee on President's Address.

REPORT OF COMMITTEE ON PRESIDENT'S ADDRESS.

Mr. Printz then submitted the following report, which was adopted.

Your committee commend the President's Address to the careful reading and consideration of the members of the Association that they may profit by the suggestions made therein. And particularly would we call attention to the section referring to the tar product; but would defer action on the recommendation of that portion until your committee on tar shall have made their report.

The committee further approves and recommends the action proposed by the President with reference to the death of our esteemed fellow-members, Geo. Shepard Page, John J. Griffin, and Horace S. Walbridge.

EUGENE PRINTZ,
O. N. GULDLIN,
H. W. DOUGLAS,
} Committee.

INTRODUCING MR. F. C. SHERMAN.

Mr. Persons—Mr. President, we have with us this morning one of the old guard of the New England Association, a man who has stood up for years in line to be counted. I would like to introduce to the Chair, and to the Association, Mr. F. C. Sherman, of New Haven, Conn.

The President—The Chair would be very glad to hear from Mr. Sherman at this time if he will kindly address us.

Mr. Sherman—It is very kind of Mr. Persons and the President to introduce me in this manner. I can only say if I can further learn how to make cheap gas and good gas from the information I derive by my attendance upon this meeting I shall not be disappointed. I am very happy to meet you all, and thank you for this introduction. (Applause.)

Mr. Irvin Butterworth, of Columbus, Ohio, then read the following paper on

GOVERNOR BURNERS.

The time has gone by—if, indeed, there ever was such a time—when gas companies should desire the lighting bills of their consumers to be as large as possible. Their true interest lies in furnishing perfectly satisfactory light for the least possible money. When a gas company can make its bills for satisfactory lighting amount to less than they would be by any other means than gas, it need have no fear of overwhelming competition. Whoever can furnish satisfactory light the cheapest will get the bulk of the business. Fully two-thirds of the houses in every gas town in Ohio are lighted exclusively with oil, notwithstanding its great disadvantages, because there is a popular impression—I might say fallacy—that oil lighting is cheaper than gas lighting. Just in proportion as gas companies are able to demonstrate their ability to furnish cheaper light than can be obtained from oil, will they win over the business now being done by it; while at the same time they will suffer less from that already admittedly more expensive source of light, electricity. As it is, they lose many valuable customers, and supply many dissatisfied ones, on account of gas bills excessively large through causes easily preventable.

I was recently astonished to hear the statement made by a gentleman whose business identifies him with the gas interests, that those gas companies are making the most money who are carrying the highest pressure in their street mains, and, therefore, forcing an excess of gas through their consumers' burners; asserting that the increased leakage was more than compensated for by the increased bills. If there are gas companies who are doing this designedly and as a matter of policy, in my judgment they are making a great mistake. Even if they are not doing it designedly, they are making a great mistake. They are sowing the wind and will eventually reap the whirlwind. The time will come when they will realize that they have killed the goose that laid the golden egg.

The holding of our present business and the adding of new do not lie in this sort of abuse to our customers, to say nothing of our moral obligation to give them value received. We should study rather to make their bills as small as possible, for the reasons I have given. How can this be done? By reducing the price of gas? Yes, whenever this is possible; but in addition to this there is a better way, for the consumer, namely, by teaching and encouraging him to burn his gas economically. Instruct him as to the best burner for the kind of gas furnished and for his requirements; tell him how to keep his burners clean and the advantage of so doing, or of getting new ones occasionally; show him that there is really more economy in large than in small burners; but above all, explain to him how to get *a uniform light and at the same time a maximum quantity of light per unit of gas consumed.* My belief is that

if every gas consumer were doing this, the interests of gas companies would be vastly enhanced.

How imperfect is that system of lighting which gives to one customer from 50 to 60 per cent. more light for his money than it does to another! Or that requires one man to pay twice as much as another for a certain quantity of light! Or worse still, that allows this variation of service and cost to occur with one and the same consumer! And yet this is exactly the kind of lighting that gas companies are furnishing almost everywhere to-day, even when the illuminating power of their gas remains constant. We are fond of disparaging the incandescent electric lamp because, forsooth, it deteriorates gradually by use; but we shut our eyes to the fact that our light also, as it is generally furnished, not gradually deteriorates, but what seems to me to be fully as bad (except that it can be easily remedied), constantly and greatly fluctuates both in its efficiency per unit of gas consumed and in it its cost per unit of light obtained. This is shown by a study of the conditions under which gas is delivered at the consumer's burner, and by a few simple experiments.

It is a well-known fact that gas companies are unable, by means of the best station and district governors, to maintain a uniform or even a constant street main pressure throughout the territory supplied by them. Even an approximate equalization of street main pressure is impossible in the average city. There are bound to be locations of high pressure and others of low pressure; and, furthermore and particularly, in no one location will the street main pressure remain constant through the 24 hours, nor even during the lighting hours of any one night. Columbus is situated on fairly level ground, and yet during the past winter tests showed a street main pressure in one location of 2.5 inches during full lighting hours, while at another the pressure at the same time was less than 1 inch, through mains supposed to be amply large supplied the territory. These figures probably do not represent the extreme range of pressure in this city. It is fair to assume that differences as high as 2 inches, say from 10 to 30 tenths, exist between different sections; and that the same state of affairs obtains in most other cities, while in some still greater differences could be found.

Let us now test an ordinary gas burner, such as gas companies permit to be in general use, under pressures varying between 10 and 30-tenths in the pipe near the burner. We take first one with a 3-foot lava tip, as small tips are generally supposed to be the most economical for high pressures.

COMMON BURNER, THREE-FOOT TIP.

10ths pressure	10	15	20	25	30
Consumption	5.70	7.55	9.15	10.40	11.45
Candle power	13.36	16.62	17.64	18.88	17.08
Candle power per foot	2.344	2.201	1.917	1.815	1.492

We find the results almost startling. The consumption doubled during the test, the candle power fluctuated 5.5 candles, while the candle power per foot of gas consumed, or the efficiency of the burner, decreased from 2.344 to 1.492. By this test we can see that a consumer using 3 foot tips, and burning his gas at a house-pipe pressure of 10 tenths, gets 57 per cent. more light for his money than does his fellow consumer with the same burners, in another section of the city, who is obliged to burn his gas at a pressure of 30-tenths. We also find that for the same number of hours of burning, and for the same number of 3-foot tips in use, the gas bill of the one would be $5.70, while that of the other would be $11.75. Are we not discriminating against our 30-tenths' consumer when we allow him to burn his gas in this manner? To find whether the injustice would be lessened if 5 foot tips were employed, I have made a similar test with a tip of that size (the candle power of the gas being slightly less):

COMMON BURNER, FIVE-FOOT TIP.

10ths pressure	10	15	20	25	30
Consumption	7.45	9.70	11.50	13.15	14.20
Candle power	16.32	21.96	23.28	21.80	20.28
Candle power per foot	2.191	2.264	2.025	1.658	1.428

showing practically the same inequality of service and cost as did the 3 foot tip, the efficiency at 10-tenths pressure being 53 per cent. more than at 30 tenths, a result slightly in favor of the 5 foot tip, but still indicating a state of affairs demanding much attention before gas lighting can be considered perfect.

Now let us take the case of a single consumer, and see if the gas company treats him alike at all times. I incidentally noted a case during the past winter where the pressure in the distributing pipe of a certain church increased from 1 inch just before the evening service to 2 inches immediately after, all the burners burning full at the time of both observations. This increase of 1 inch pressure in the house-pipes of a consumer during the lighting hours of one night I take to be a very moderate one compared with others that could be found in this and other cities. Mr. Fowler, of Springfield, Massachusetts, in his paper* before the New England Association of Gas Engineers last month, mentions a variation of 2.9 inches in the street main pressure at one point in his city during the lighting hours of one evening. Practically the same variation must have occurred at the burner tips in the immediate neighborhood; and this is probably not an extreme case. And, yet, let us see what even this comparatively small increase of 1 inch, in the case I have mentioned, signifies: If 5-foot tips were used, reference to the above test shows (1) that the church's light at the close of the service was costing it 54 per cent. more than it did at the beginning of the service; (2) that the quantity of light per foot of gas consumed had decreased 8 per cent.; (3) that if the church was sufficiently lighted at the beginning of the service, it had an excess of 43 per cent. of light at the close. Incandescent electric lights that would give such irregular service as this would be denounced by gas men as hopelessly imperfect. It is bad enough to have an excess of light when it is not wanted or needed; it is worse still to be forced to pay for it, and at a higher rate than for a similar quantity of sufficient lighting!

I am aware that consumers do not often complain about these things; but it is simply because they are ignorant of the loss which high and irregular pressures cause them, and it is manifestly the duty and interest of the gas company to correct, as far as possible, these inequalities, whether they are known and complained of or not. What gas company does not suffer from the silent educating effect upon the public mind of the frequent sight of "blowing" and "flaring" gas burners, due to excessive pressure? Unconsciously the public draws an unfavorable comparison between these unsightly and unscientific flames and the steady, ornamental electric light, and even the oil lamp. "Blowing" burners have done much in this way to favor the growth of the former and the retention of the latter. I consider it of the utmost importance to gas companies that all gas burners in public places especially—halls, churches, show-windows, stores, etc.—be kept clean and in condition to burn properly at all pressures. I believe that, if necessary, gas companies can well afford to do this at their own expense. I need not mention that to varying pressures, or rather to the absence of burners adapted to consume the gas properl notwithstanding these variations, is due the vitiation of the atmosphere of rooms and the smoking of ceilings, which all gas m recognize as defects extremely discreditable to the business of gas lighting as it is now carried on.

It would be indiscreet to thus publicly mention these defects and imperfections in gas lighting, were not a complete and easy remedy for them already at hand awaiting application. And having thus, to some extent, emphasized and impressed upon you the importance of burning gas properly, to-wit, so as to secure at all times (1) a uniform light, (2) a maximum efficiency, and (3) a perfect and complete combustion, I will venture some suggestions as to how this may be most nearly accomplished.

I will assume that the gas company has already done all that can be done toward securing constant street main pressure by the use of station and district governors, mains of ample size, etc., in spite of all of which, however, the irregularities of which I have spoken will still largely exist. The best method thus far discovered for completing the work of equalizing these variations is to control them *at the burner tip* by means of check and governor burners, particularly the latter. Of course consumers can check excessive pressure to some extent by reducing the flow of gas at the meter, but this goes only a short way toward the solution of the problem. Burners will still "blow" when the pressure becomes high, and in upper stories and when a limited number are in use; and they will smoke and give an insufficient light if all are in use when the pressure is low. Pressure regulators at the meter may also be used to advantage in some instances, where the lights to be controlled are all on one level, as in a hall, or in a factory of several floors, in which a regulator may be placed at each floor to control the pressure for that floor. But of these governors no less an authority than Mr. F. W. Hartley says: "It is quite manifest that a governor [meaning a pressure regulator at the meter] cannot maintain an equality in the rate of consumption per burner when the number of burners is varied, and when the gas is transmitted through pipes. A loss of pressure must arise from friction, which loss, all other things being equal, will vary with the rate of discharge."

Check burners also have their uses, but they do not in any sense govern the pressure or regulate the flow of gas. Here is a test of an Empire check burner, adjusted to consume nearly five feet per hour at 20-tenths pressure and having a five-foot tip:

EMPIRE CHECK BURNER, FIVE-FOOT TIP.

10ths pressure	10	15	20	25	30
Consumption	3.10	4.05	4.85	5.50	6.05
Candle power	9.24	12.44	15.18	16.74	18.04
Candle power per foot	2.981	3.071	3.129	3.044	2.982

I also give a test of another good check burner (non-adjustable), a

NO. 6 BRAY SPECIAL.

10ths pressure	10	15	20	25	30
Consumption	6.10	7.75	9.10	10.25	Blowing.
Candle power	15.60	18.56	20.74	22.72	.....
Candle power per foot	2.557	2.395	2.279	2.216	.....

It will be seen that about the only advantage which a check burner possesses over a common burner is that its efficiency per foot of gas consumed is more uniform. They will "blow" when the pressure rises much beyond that for which they are adjusted,

*See JOURNAL, p. 329, March 6, 1893.

they will smoke when it falls much below that point, and their consumption and the candle power given by them will vary with the pressure. And yet I regard check burners—particularly the Bray "Special"—as being much superior to common burners, as with proper attention and adjustment they can be made to produce well shaped flames and reasonable gas bills. They also have the advantages over governor burners of costing much less, their price being not more than 5 cents apiece, whereas the present average price of governor burners, to gas companies buying in quantity, would be about 30 cents.

Nevertheless, it is to governor burners that we must look for the best results thus far obtainable in gas lighting. They solve the problem, almost to perfection, of supplying a uniform light through varying pressures, with a constant and maximum efficiency, and, therefore, with no vitiation of atmosphere nor smoking of ceilings. The desirability and value of an inexpensive, accurate and reliable governor burner have long been recognized, and many inventors have devoted much time and energy to perfecting such an instrument. How well they have succeeded is evidenced by the fact that one recently tested for S. Calvert Ford of Washington, D. C., showed a variation in consumption of only two-thousandths of an inch, under a range of pressure from 1 inch to 5 inches, burning for 6 minutes at each pressure. The mechanism of an instrument, small and neat enough not to be unsightly on a parlor fixture, and that will accomplish the difficult task of delivering, almost to a nicety, a constant quantity of gas at a constant and low pressure to the burner tip, regardless of the great variations in the pressure back of it, must needs be interesting. With the distinct understanding that it is not to be considered an advertisement of any particular make of governor burner, but simply to illustrate the mechanism and principle of governor burners in general, I have procured an electro-plate of a typical form of such a burner, a print from which is here given. Briefly, it contains a chamber separated by a horizontal disk into two compartments, one below and one above the disk. The disk is free to move up and down in the chamber, into which it fits very snugly. To the disk is attached a valve, which rises or falls with the disk when the pressure of the gas below the same increases or decreases, thereby opening or closing automatically the gas outlet at the top of the chamber above the disk. An orifice is provided, either in the disk itself or, as in the one here illustrated, through the walls of the disk chamber, through which the gas passes from the space below into the space above the disk. As the gas pressure above the disk is always less than that below it by a difference equal to the pressure required to raise the disk, which pressure of course is constant as the weight of the disk is constant; and as it follows that this difference is also always the same, therefore, just as much gas will pass through the orifice under one initial pressure as another. When the pressure below the disk increases, the quantity of gas that would pass through the burner would increase correspondingly, were it not for the fact that the increased pressure raises the disk, and the valve attached to it rises with it and partially closes the gas outlet, So that while there is more pressure below the disk, there is a corresponding increase in the pressure above it, because the gas is held back by the reduced outlet, and the gas passing through the burner will therefore remain the same as before. The quantity of gas can be varied by increasing or decreasing the area of the gas-way around the disk, by turning in or out a screw, as in the one here illustrated; or, in the case of non-adjustable burners, the different sizes are made separately by varying the area of the fixed orifice through or around the disk. A further description is unnecessary here. Those desiring to do so may find detailed information in "King's Treatise," and in the pamphlets of the various governor burner makers. The principle of all governor burners is essentially the same, though they vary considerably in internal construction, some being much more complicated than others.

I have here governor burners of 8 different kinds, namely: Chamberlain's, Rappleye's, the "Champion," Wilder's, Boore's, Peeble's, Sugg's and Lux's. Peeble's is made in Scotland, Sugg's in England and Lux's in Germany. Wilder's, Boore's and the "Champion" are adjustable to different rates of consumption, the others are not. I will designate the 8 burners by numbers, and will give you the result of their test:

GOVERNOR BURNER TESTS, SHOWING CONSUMPTION.

KIND.	SIZE.	10-10	15-10	20-10	25-10	30-10	35-10	40-10
1	6 foot.	6.20	6.20	6.35	6.30	6.25	6.25	6.40
2	6 "	5.95	6.50	6.20	6.20	6.05	6.15	6.05
3	5 "	4.50	4.50	4.55	4.55	4.65	4.65	4.60
4	5 "	4.50	4.65	4.55	4.65	4.70	4.65	4.55
5	5 "	4.90	4.95	4.95	4.95	4.90	4.90	4.90
6	Adjustable.	5.60	5.50	5.40	5.30	5.07	4.80	4.60
7	"	4.96	5.97	6.21	6.19	6.05	5.89	5.69
8	"	4.95	4.95	4.95	4.95	4.95	4.95	4.95

It will be seen that some of the burners do not pass exactly the same quantity of gas at all pressures; No. 8, however, did perfect work throughout the test, and No. 5 did practically the same. All of the burners, however, control the flow closely enough for all practical purposes, and even the worst one gave vastly better results than would a check or common burner. Let us take a governor burner giving average results, and compare it with a common and a check (Empire) burner, the test being made at one sitting, using gas direct from the holder, and employing identically the same tip (5-foot) in each burner, in order that all conditions might be as nearly as possible the same. We will test through a range from 10 to 30-tenths only, since these limits include all ordinary cases of variation in pressure at any one point:

COMPARISON OF COMMON, CHECK AND GOVERNOR BURNERS.

10ths Pressure.		10	15	20	25	30	Variations from Maximum.
Consumption.	Common....	7.45	9.70	11.50	13.15	14.20	47.5 per cent.
	Check.....	3.45	4.55	5.40	6.10	6.80	49.3 "
	Governor...	5.25	5.25	5.25	5.15	5.02	4.4 "
Candle Power.	Common....	16.32	21.96	23.28	21.80	20.28	30.0 "
	Check.....	9.38	12.00	13.70	15.46	17.02	44.9 "
	Governor...	14.22	14.08	14.34	14.16	13.88	3.2 "
Efficiency.	Common....	2.191	2.264	2.025	1.658	1.428	37.0 "
	Check.....	2.748	2.638	2.535	2.534	2.503	8.9 "
	Governor...	2.709	2.682	2.731	2.749	2.764	2.9 "

COMPARISON OF VARIATIONS FROM MAXIMUM.

Burner.	Consumption.	Candle Power.	Efficiency.
Common.....	47.5	30.0	37.0
Check.....	49.3	44.9	8.9
Governor.....	4.4	3.2	2.9

A study of the above figures will, I think, show the great superiority of governor burners over common and check burners. It must not be inferred from them, however, that because the check burner permits a greater variation in consumption and in candle power than does the common burner, that it is inferior to the common burner. It will be noticed that the efficiency of the check burner is much higher; that, although the consumption increased with the pressure, the candle power increased almost, but not quite, in the same proportion; whereas, the efficiency of the common burner decreased as the consumption increased. The weak point of the check burner lies in the fact that its consumption and the candle power given are far from constant; for instance, when adjusted to give a sufficient light at 20-tenths pressure, it will give an insufficient light when the pressure decreases and an excess of light when it increases, the gas consumption fluctuating correspondingly. It might make a good average, perhaps, but, as Mark Twain said of his watch when it ran too fast half the day and too slow the other half, "a good average is a very mild virtue" in a gas burner. It should be said, however, that in locations where the pressure remains constantly high, with but slight variations, a check burner would be quite efficient and satisfactory. But even in such a location a governor burner would be better, for the best ones are almost perfect in their work. In fact, governor burners furnish the best means thus far devised for obtaining perfect gas lighting under all circumstances. (I am speaking now of burners for general use, not of high candle power lamps for special purposes.) In locations where the pressure is already insufficient or uniformly low, common burners are not especially wasteful; where the pressure is high, but uniform (and there are but few of such places), check burners can well be employed; but in all other locations governor burners would be of mutual advantage to both the consumer and the company. I believe every gas company should encourage their adoption in every way possible, taking the matter in hand themselves, and not leaving their introduction to the intermittent efforts of the itinerant "patent burner" peddler, who has humbugged the gas consumers in every community until they have no confidence even in a meritorious governor burner when offered by him. Governor burners constitute an efficient weapon as yet unused by gas companies in their battle with competitors. Gas lighting as a system will not have attained the highest degree of perfection of which it is capable until all burners produce a constant light, with a maximum efficiency, and with no vitiation of atmosphere nor smoking of ceilings. Governor burners seem to place this end within our reach. It is true they are as yet imperfect; Mr. Peebles, of Edinburgh, the inventor of the Peebles' governor burner, one of the best, has given much time and work to the perfecting of his burner; and yet he recently made the frank confession, before a body of gas men, that he was far from satisfied with it. The best governor burners will vary slightly in their consumption after being used; they need occasional cleaning; they sometimes get clogged and "blow;" occasionally one will be found with a "chattering" valve, that causes the light to flicker; nevertheless, they are reasonably perfect, and will probably be still further improved in the future. Their chief objection is their cost, but this will be greatly reduced as the demand for them increases. I understand that a good governor burner is about to be put on the market at a price to gas companies of about 16 2-3 cents apiece; and I have a letter from the maker of a well-known governor burner that has heretofore sold at about 30 cents apiece, in which he says that if a sufficient number of gas companies will adopt

his burner for the use of their consumers, selling them at cost so as to make a large demand, he will agree to furnish them at 15 cents apiece, "guaranteed not to vary, at any pressure, 5 per cent. from their stated rate of consumption." This, in my judgment, is an offer well worth considering.

I am sure it is unnecessary for me to say, in conclusion, that I have no pecuniary interest in any governor burner, and have only been led thus to commend them because the possibilities contained in them for the good of gas companies have commended them to me.

Discussion.

The President—I regard the paper just read as very valuable, one that is based on practical investigation; and the Association is certainly indebted to Mr. Butterworth for giving us the benefit of his experiments. The paper is open now for general discussion.

Mr. Nash—I think this is one of the most important questions coming before the Association. The great trouble that I find is that gas fitters take no interest in the kind of burners they put on gas fixtures, and unless you give it personal attention there is a great deal of dissatisfaction, and some have good cause to be dissatisfied, and the gas company's interests are injured in this way. If we can get good governor burners at the price mentioned here, 15 cents apiece, I think one of the best investments a gas company could make would be to furnish those burners and put them on.

Mr. Donald McDonald—I would like to ask Mr. Butterworth if he holds that a smoky ceiling is caused by bad combustion of gas alone? I have seen a dirtier and a blacker ceiling from a steam radiator than I ever saw from a chandelier. My own idea is that nine-tenths of the smoke and dirt which find a way to the ceiling comes from other causes than bad combustion.

Mr. Butterworth—Mr. McDonald is undoubtedly right. Nine-tenths of the smoke and dirt on the ceiling above a gas burner is from soot and impurities deposited there from the air. On the other hand a gas burner, burning imperfectly, would also undoubtedly smoke a ceiling.

Mr. Donald McDonald—My observation is that a piece of moulding, or a wire, or anything that causes a ripple in the air, will cause an impingement of the particles of carbon, as it were, in the atmosphere, against the surface of the wall, and it will make a black streak. And, again, impurities from the air find their way into the room and are carried upward from the current of air created by the burning gas and lodged upon the ceiling, and, no difference how good the gas may be, you will have black ceilings anyhow, if you live in a dirty town or a dirty part of the town.

Mr. Butterworth—That is true.

Mr. Douglas—I would like to ask if the Bray burner is a low or high pressure burner?

Mr. Butterworth—This was made for low pressure. I picked three Bray burners adapted to low pressure out of the box which I received, and tested them; one blew at 20-tenths, another at 23-tenths, and the third at 27-tenths. They are not uniform, even though made alike, apparently.

Mr. Douglas—This is what is called a low pressure burner.

Mr. Butterworth—Yes, sir; the high pressure Bray "special" burns all right at 40-tenths, but it don't burn well at low pressure.

Mr. Starr—I am very much pleased with Mr. Butterworth's tests. I have always advocated that gas companies should take the question of burners into their own hands and see that their customers are properly supplied. However, it is an expensive matter to supply a city with governor burners, so that you had better do the next best thing. Now we have discarded, years ago, the 3 foot burner, so that the test of that we do not care anything about. But take the 5 foot burner, the Empire check. That burner costs, I think, about $5 a gross. We supply them to our customers free, and have done so for the last ten years. So far as the candle power is concerned, the consumption of 10-10ths is 3 feet, and at 30-10ths it is 6.5 feet. Now, the candle power for 10-10ths is 9.24, and for 30-10ths it is 18.4. That is pretty nearly double; so you see you have not lost much by using that kind of a burner, and it is a cheap burner for gas companies to furnish. We furnish, I suppose, 30 gross of them a year to our consumers. If they want to fit up a new house they will take away 40 or 50 burners at a time. We authorize the gas fitters to get and put them on, and the result is a 5 foot burner giving them 18 candle power. It gives them a good light, and that is what everybody wants. In dealing with your consumers the proper plan is to give them plenty of gas and a good light. Give them good pressure. Give them good sized burners, and then charge a low price, and you will find that it works wonderfully well. The cheapness of the burner enables you to furnish it free, and then the fine candle power they get pleases the customers and there is no trouble. But the governor burner is a little too dear at present; they cost too much. Now, if a check burner gets out of order, and a customer says "my burner is not working all right," we send a man around immediately and put in a new one. He examines the burners in the house, and he will find probably three-fourths of those burners in good order, but the one which is used the most, in the dining room or in the kitchen, or in the sitting room, will sometimes get out of order and get dirty. In water gas a product from the tar gets into the gas, burns hard at the tip and reduces the size of the opening; then they get too little light. What I have been saying, though, is with reference to the kind of burners; our experience is that they will give good light. The consumers complain more of a want of light than they do of the largeness of the bill. We find the Empire check burner the most satisfactory of any we have tried, and always keep them in supply.

Mr. Coombs—The gas company I am connected with have, for the last 4 or 5 years, supplied their customers with the Empire check, in the same manner that Mr. Starr has stated. They look after all their customers and provide them with the Empire check. In hotels especially we cut down the gas with the Empire check to two-thirds of a foot in the bed rooms. But this last year we have changed off from the Empire check and have used what they call the No. 6 Bray's special. We have, since last August, put in about 2,500 of them. The Empire checks were taken off and these were put in their place. The reason we did so was that we found we would have more or less trouble with the dust or dirt stopping up the split tips. Of course, I always hate to see a ragged or forked flame on the street or any place else, and, wherever we find such a flame, we immediately have it attended to. When we ran across the No. 6 Bray's special and tried it, we found it worked very satisfactorily, and, since we have introduced them, we found that the burners stand uniform. When we put them there they stay there. That is our experience. I do not know how long they last.

Mr. Starr—I suppose they are big enough to let anything go through?

Mr. Coombs—Well, that may be; but they have a very uniform flame and make a very bright light and we are still putting them on. We, of course, use the Empire check also, but we use them where we want to cut down the burner to a small flame, as, for instance, down to two-thirds of a foot an hour in a bedroom; and in that way our consumers are satisfied. They are better pleased with the gas. Give them a good 19 to 20 candle power gas and see that their burners are kept in good shape, and you will have no trouble with your consumers.

Mr. Miller—I would like to ask if Bray's special is a fishtail burner.

Mr. Butterworth—Yes, sir.

Mr. Miller—I would like to ask if anyone has compared a fishtail with a batwing, using the same gas, with a view to ascertaining their relative efficiency? This comparison of the Empire check and Bray's special would serve, I suppose, as a fair sample. You can see from it that the efficiency of the fishtail is very much less than the batwing, and although I have not tested a fishtail that had a lava tip like the Bray's special, yet I have tested the others, and find the efficiency will not run over 75 per cent. of the sawed tip. I should think there was a great element of loss in that one thing, and if the dust was cleaned out at long intervals it would give a very much greater efficiency.

Mr. Butterworth—I should say these tests were made at different times and the candle power of the gas would probably vary some. The figures given could hardly be relied upon for a comparison on that account; the comparison as to the relative efficiency would hardly be a fair one to make.

Mr. Miller—I hope the gas used by the gentleman who read this paper does not vary 20 per cent.

Mr. Butterworth—Oh! no; the variation in candle power would not account for all of the difference, but the comparison might not be perfectly reliable.

Mr. Light—I would say we have used the Empire burners very successfully. We have some trouble, as you all no doubt have experienced, on account of the check getting stopped up. But we have not found any yet that works as well as the Empire check.

Mr. Shelton—I have been very much interested in this paper, because I think it is a very fair exposition of the doctrine of governor burners. I think, so far at least, we cannot help but agree that governor burners would furnish better results if universally used. I think there is no question but that governor burners are all right at the start, yet my experience has been that the difficulty comes not in the beginning, rather in maintaining these governor burners year in and year out. Mr. Butterworth has evidently given as much attention to the subject as any man in the Association, and I should like very much to know his judgment as to how long governor burners would run satisfactorily without attention, as to the cost of looking after them, and as to how long it would be before they would have to be renewed. In other words, when they can be cleaned and looked after, they give good results; but do they fill the bill year in and year out for ordinary use? Do they not gum up, stick, and give considerable trouble after a time? I have heard that that has been the chief objection to them. I do not know how long Mr. Butterworth has been using them. I would also like to know what governor burner he leans towards as being the best, if he could indicate it without directly advertising that particular burner—perhaps that information would better be given quietly, rather than publicly from the platform. I think the questions of the ultimate care and renewal of the governor burners, and the attention required by the consumers in caring for them, have been the greatest objections to them so far. I would like to hear some discussion as to how long a governor burner may be used satisfactorily without attention and without renewal.

Mr. Butterworth—Of course the members will understand that I cannot with propriety answer publicly Mr. Shelton's inquiry as to which governor burner I consider the best. I think he is right in his statement that the chief objection to the governor burners comes from the fact that they require attention. That fact will militate against their introduction more than anything else. I sold a man a couple of governor burners of good make some time ago—certainly inside of two years, and I think possibly inside of one. I didn't preserve the dates. He complained that his burners blew,

and, on going out to his house, I saw that they were blowing badly. I stated in my paper that governor burners need frequent cleaning, but they should not need renewing. I do not know how soon the time will come when gas companies will take hold of the governor burner matter, put them in free, and institute a regular system of looking after them for their consumers. All large bodies move slowly. Ten years ago gas companies paid no attention to the burners. I find, however, that they are now giving attention to this subject, as is evidenced by the remarks of Mr. Coombs and Mr. Starr. Gas companies are taking an interest in them, and some companies are furnishing their consumers with check burners free that cost 5 cents apiece. I predict the time will come when gas companies will either put governor burners on at their own expense, or sell them at half price, or something of that sort, and then institute a system of looking after them for their consumers.

Mr. Printz—We have used the Bray Union-Jet special burner for some three years, and it gives us entire satisfaction. We make it a point to give a certain sized burner for a certain location, with reference to pressure. For instance: For high pressure we give a No. 5 burner; for the next elevation, No. 6; and for a low pressure point we give a No. 7. In that way we handle our consumers very nicely, and we prefer the Union-Jet because of its construction. It is similar to the fishtail burner, and not as likely to close up as the batwing. We are very well satisfied with them. We make it a point to give these burners away. They cost us 5 cents apiece.

Mr. Greenough—I have listened to this paper with a great deal of interest, and to what has been said by the gentlemen in way of discussion. It is exactly the sort of paper which is of interest to a gas association like this, and I do not think it can be commended too highly. I have got nothing new to offer on the subject, however.

A vote of thanks was then extended to Mr. Butterworth.

Mr. Alten S. Miller, of Chicago, then read the following paper, entitled,

OILS FOR GAS ENRICHING.

Many materials have been used for making and enriching gas including rosin, cannel, vegetable and animal oils, the oils produced from the distillation of shale and coal, and petroleum. The latter being the principal material used for gas enriching in America at this time, to it will our attention be chiefly confined.

Petroleum is one of the forms of bitumen and occupies a position between the heavy bitumen or asphalt and natural gas. Many theories have been advanced to account for the formation of bitumen, but we can not discuss them at this time. It has been known and used since the beginning of history. Recent researches amid the ruins of Babylon and Nineveh show that the masonry used in those cities was united by a cement composed principally of bitumen, and it is said that this same cement was used in the tower of Babel. Herodotus mentions seeing pitch drawn up from a lake in the island of Zante, and later writers mention bitumen in various parts of the East.

The oldest authentic record of oil or bitumen in this country is a letter written by a Franciscan Missionary, Joseph de la Roche D'Allion, which was published, in 1632, in Sagard's History of Canada. In that letter he mentions oil springs in what is now the State of New York. Previous to 1859 petroleum was collected in small quantities from the springs and salt wells of western New York and Pennsylvania, and of West Virginia, Kentucky and Tennessee. It was used largely for medicinal purposes, but a still having a daily capacity of 5 barrels was erected in Pittsburg, and illuminating oil turned out in small quantities. On Saturday, the 28th of August, 1859, the drill struck oil in the first petroleum well and since then the oil has been produced in enormous quantities.

The use of oil for gas making is not a new thing. Accum, Peckstone, Daniell, Taylor, Hills and many others have described, and, in some cases patented, apparatus for the manufacture of gas from oils and fats. None of these proved a success, and little if any use was made of them, so that when the Gale-Rand patents were taken out they came almost as a new process and created a corresponding amount of interest. The process was to gasify the oil and dilute it with air.

The effect of air as a diluent is so well known that it requires only passing notice. Mr. Vernon Harcourt in experimenting with ethylene, and using air, carbon monoxide, and hydrogen as diluents obtained the following results, the percentage of dilution being the same in each case:

Diluent,	C. P.
Air,	28.0
Hydrogen,	36.2
Carbon monoxide,	34.0

Experiment shows further that, as the percentage of diluent is increased, the candle power falls much more rapidly with air than it does when a combustible diluent is used. It is advantageous, therefore, in distributing an oil gas diluted with air, to keep the candle power as high as possible. Another drawback was encountered in the use of air, for the nitrogen not only cooled the flame so as to make it smoke, but reduced it to such a condition that the slightest draught would extinguish it.

In view of these difficulties attention was turned to the use of oil for enriching coal gas. The latter was passed over naphtha which was at the same time heated by steam. The gas charged with hydrocarbon vapor was passed through retorts and the vapors fixed. This was a great advance in the right direction, but it was soon discovered that the flame temperature of the gas was low and when enriched to 20 candle power and consumed in the burners generally used, combustion was incomplete and the gas smoked.

Since that time oil has been used for enriching coal gas in various ways. One way has been to pour it over the coal to be distilled in the retort, and to let it distil over with the gases from the coal. Another way has been to make a cartridge of small pipe and fill it with coke. The coke is saturated with oil and the cartridge, with one end left open, is charged into a retort. Still another way, and one that has been very generally used, is to feed the oil into a regular coal retort through a small pipe at a uniform rate and to let it distill slowly.

In every case it was found that the gas would soon begin to smoke, and so the expedient of adding water gas to raise the flame temperature was resorted to. This proved satisfactory in every respect, and since then water gas has been used almost exclusively for diluting the oil gas.

When it was settled that oil gas could be used successfully and that it required water gas to dilute it, engineers began to experiment in the direction of making both gases with one fire and in a single operation. This was accomplished and patents granted to several persons for apparatus that would attain this result.

Meanwhile work had also been done in the direction of making and delivering pure oil gas, and in spite of its many drawbacks a number of small towns in various parts of this country are depending upon it entirely. The advantage of making the pure oil gas lies in the very small cost of the plant. The oil is gasified in retorts, made out of short pieces of wrought iron pipe, which are set in a bench of simple construction. When naphtha is used no purifiers are needed, as there is no sulphur in the gas, and after a very small amount of scrubbing and condensing the gas is ready for distribution. The gas is not distributed in any town that can afford to pay for a good plant to make either coal or water gas.

As soon as it was decided that the proper diluent for oil gas had been discovered, the latter came rapidly into use. Plants were erected in every direction, and in spite of a deep-seated prejudice the oil gas steadily grew in favor. For a long while the engineers depended on naphtha, but in time experiments were made with crude oil and residuum. These experiments caused no end of trouble and annoyance.

The fixing surface of the apparatus was deficient, and in consequence the oil was not entirely changed into a fixed gas. In case the apparatus was run sufficiently hot to fix the gas, it soon became stopped with carbon, and naphthaline rapidly manifested itself throughout the works.

Experiments were then made in the direction of increasing the fixing surface and reducing its temperature with highly gratifying results. The advantage of fixing the hydrocarbons at a low heat was at once shown, and it was found that the vapors were entirely changed into a fixed gas. The carbon that had been deposited in a free state, and also that which had previously been deposited as naphthaline, remained in the gas, and so caused a very marked economy in the consumption of oil. The latter was reduced from 15 to 25 per cent.

In addition to the advantage attained by working at a low and uniform heat much has been gained by fixing the oil in the presence of the diluent. Many experiments have been made in the direction of making the two gases separately and mixing them afterwards, but in every case it has proved unsatisfactory. When the oil vapors are fixed alone the tendency is for them to be decomposed into the lower hydrocarbon series, which results in a great loss of light. When it is fixed in the presence of a large proportion of an inert gas, much more of the product belongs to the benzine and olefine series and the resulting illuminating power is higher. The gaseous envelope protects the hydrocarbon vapors or gases, and allows them to be heated uniformly without letting any part be overheated. If an ordinary illuminating gas is passed through a highly heated retort, there will be a large deposit of carbon and the illuminating power of the gas will be found much reduced. On the other hand, if the gas is first mixed with two or three times its volume of any inert gas, such as hydrogen or carbon monoxide, it will be almost unaffected. When the oil is gasified alone, as in the Pintsch plants, 750 candle feet per gallon is an unusually high result, if it has ever been attained. In the manufacture of water gas it is not unusual to get 1100 to 1200 candle feet per gallon, and higher results have been reached in every day practice.

The very important question regarding the use of oil for enriching is what oil should be used? Much depends on the apparatus, as a light oil can be readily gasified with a heating surface that would not fix crude oil or residuum, and, if the latter are to be gasified satisfactorily, a large superheating surface must be used. It is important, therefore, in deciding between crude oit and naphtha, to take the amount of heating surface into consideration. The experiments quoted by Mr. Egner at the '91 meeting of the Western Gas Association show that the crude Lima oil gives about 9 per cent. more light when distilled in Pintsch retorts than is given by Lima naphtha under the same conditions. The difference between the Pennsylvania crude and the Pennsylvania naphtha is much greater than this. Practice in the use of the Lima oils for enriching water gas has demonstrated the superiority of the crude oil. A given quantity of the latter will give from 8 to 10 per cent. more light than the naphtha.

A marked advantage in favor of crude oil is the tar that is made. With naphtha only about four-tenths of 1 per cent. of the oil is recovered as tar, while, when crude oil is used, notwithstanding the

increased illuminating power, nearly 7 per cent. of it is recovered in the tar well. This does not cut much of a figure while tar is as cheap as it is at present, but it demands consideration.

Regarding the supply of oil, there seems to be little to fear. The immense deposits are apparently as inexhaustible as our coal mines, and whether it is being generated in the laboratories of nature, or whether its production has ceased, there will be enough to last us for generations.

Although petroleum has enabled us to increase the illuminating power of our gas 50 per cent., and, at the same time, to lessen its cost, it has not brought unalloyed happiness to those interested in the gas industry. There are in use to-day millions of lamps and vapor stoves that would be replaced by gas were it not for the cheap petroleum, and this in spite of the wonderful growth of the gas business. It would be to the interest of the industry to exhaust the great stores of petroleum, were such a thing possible, as, with those out of the way, we could do an amount of business hitherto undreamed of. The indications are that this competitor has come to stay, and it will not be put aside, so that the only thing for us to do is to make good use of it and vanquish it with its own light and heat.

Discussion.

The Chair—In discussing this paper, Question No. 24 will be taken up: "What is the relative efficiency of naphtha and benzine as an enricher of coal gas?" The paper and Question 24 are now before the Association.

Mr. Shelton—I cannot reply to Question No. 24, not having any experience as to the relative efficiency of naphtha and benzine as an enricher of coal gas. In connection with Mr. Miller's paper, I may say I was very much interested in it. I think he has given an excellent account of the gradual coming in of oil into the gas business. He certainly started far enough back, commencing as he did with the Tower of Babel. Whether gas was made then or not I do not know. He has, however, brought the subject down to date, and in coming down to date it brings up the subject of the relative value of crude oil and naphtha. This question is becoming of more importance, as the prices are quite different now from what they were a year or so ago. Whether it is better to use crude oil or naphtha, I should say, depends on the local conditions and the prices. In the past I think that crude oil has had a distinct advantage over naphtha, on account of its selling at a very much lower figure. I refer, of course, to plants adapted to the use of crude oil. But at the present time the price of crude oil has advanced materially, while the price of naphtha has come down materially. So that, I think, they may be considered very close together, practically on an equality. There always has been a great number of plants, and probably always will be, that are inadequate in their superheating surface, in which nothing but naphtha can be used, and in which naphtha is undoubtedly the best. But the question of price is a question of local consideration. Prices have changed very much in the last year or so.

Mr. Miller—Of course, it requires a little closer watching and a little more skill to handle crude oil than it does to handle naphtha. There is a greater variation of heat that naphtha can be run through without making naphthaline or lampblack. If handled rather carelessly, any gas maker will not be likely to find much difference, and it is only by careful watching that such results as I have named can be obtained.

Mr. Nash—I would like to ask Mr. Miller is there any difference in the danger of handling the two, as between naphtha and crude oil? Is naphtha any more dangerous, any more inflammable?

Mr. Miller—In reply to that I would say there are materials in crude oil that have a higher flashing point than there are in 63° naphtha. While I have never experimented on it myself, yet I would suppose that the flashing point of crude oil would be lower than the flashing point of naphtha. I have never had any accident with either. Either of them will burn in an open pan and, therefore, it is dangerous to bring fire near them.

Mr. Starr—While I use crude oil, I do not know anything as to the relative efficiency of naphtha and benzine, or crude oil and naphtha. I would say this, that in the use of crude oil we have found very satisfactory results. We use it with the McKay-Critchlow process, and I presume it can be used in the others with equally good results.

Mr. Miller—Mr. Starr says he has satisfactory results with crude oil. In view of his statement a little while ago, about tar stopping up his burners, I should say it was not satisfactory. It is a well-known fact that water gas can be made without stopping up the burners at all. I should say his results were not absolutely satisfactory with crude oil, although he now thinks they are.

Mr. Starr—I would like to know the name of the town that uses water gas that don't have the burners coated on the edge of the opening?

Mr. Miller—Omaha, Neb.

Mr. Starr—That is away West (laughter). They do it in this latitude.

Mr. Miller—The dust from the air will stop up the burners, or the dust that may accumulate from sweeping the floor, etc.; but water gas properly manufactured and properly purified will not stop up the burners any more than coal gas.

Mr. Starr—Well, I don't dispute that.

Mr. Greenough—I would like to ask Mr. Miller whether there is not more trouble in that respect with gas made from crude oil than with gas made from naphtha?

Mr. Miller—Not when gas is properly manufactured, and when you have a proper plant. If you have a plant like Mr. Starr's you may have some trouble. The superheating surface is small; but where you put the gas through a length of 24 or 25 feet of heating surface, and the gas is properly baffled, there is no trouble on account of stopped burner tips.

Mr. Starr—I want to take exception to a remark made by Mr. Miller. He speaks of the dust falling on the outside of the burner. When the gas is lit it will blow that all off. The trouble with the burners stopping arises from the rust that is in the pipe coming through the pipe and lodging in the burner. It is not from the dust on the outside. I take issue with you there.

The Secretary—If that is the case, why is it that, in a store lighted by electricity, where the gas burners are turned off for a year or so, and then the electric lights are discontinued and the gas is again turned on, the gas burners are all dirty and the flames forked? As I understand it, there has been no rust carried through the pipe, but, as Mr. Miller suggests, the dust from the outside has accumulated in the tip.

Mr. Starr—It may have a coat over it from waiting a year or two, but not by a few days' waiting.

Mr. Miller—Flies will stop them up too.

Mr. Starr—Yes, they have a pasty deposit that sticks.

Mr. Gwynn—I would like to ask Mr. Miller whether, in a properly constructed water gas plant, you don't get a better yield per gallon from crude oil than from naphtha?

Mr. Miller—I stated that if the apparatus is designed especially for that purpose, it has a greater superheating surface, which will, of course, use both of them better than if the superheating surface was insufficient, and if properly operated you do get a little better results.

Mr. Gwynn—Out of crude oil?

Mr. Miller—Yes, but unless it is operated with a great deal of care such will not be the case.

Mr. Gwynn—You cannot do that with McKay-Critchlow process?

Mr. Miller—No; the superheating surface is deficient in that, and you can handle naphtha with a great deal more satisfaction than crude oil. A great many machines handle naphtha that won't handle both. On the other hand, with a sufficient superheating surface you can handle both with perfect satisfaction.

Mr. Gwynn—I think Mr. Starr's trouble is probably occasioned by running his generator very warm and making a great deal of lampblack, and he probably don't clean it. That is where his trouble is.

Mr. Greenough—Mr. Miller says, "When the oil is gasified alone, as in the Pintsch plants, 750 candle feet per gallon is an unusually high result," etc. What does he mean by that, 100 feet of 75 candle gas?

Mr. Miller—About 70 feet of 60 candle gas.

Mr. Greenough—How do you get the 750 candle feet?

Mr. Miller—I do not know that those are the exact figures, but the product of the gas made into the candle power, divided by five, gave that figure. There are that many candle feet, because the candle feet was given for five feet of gas, and not for one foot.

The Secretary—I am considerably interested, theoretically, in question 24. In fact I am the author of the question. I was speaking to one of the best chemists in Columbus the other day about enriching our gas with naphtha, and he said "Why don't you use benzine?" I told him frankly that I didn't know. He said, "Certainly, benzine will enrich it. It is the benzines in gas that give the light." And the question as to the relative efficiency of benzine and naphtha was brought up. I thought there must be a big difference between benzine and naphtha, although Mr. Miller tells me, on the quiet, that he don't know what the difference is. There is one difference at least, and that is as to the price. I got a quotation from the Standard Oil Company of 6¼ cents on benzine, so that there is a difference in the price at least between benzine and naphtha.

Mr. Persons—I do not know as to the relative efficiency of benzine and naphtha, but benzine has a very light gravity and is so volatile that I doubt whether you could use it with any degree of benefit in enriching gas. It would get away from you. And it would make lampblack at a very low heat. I doubt if you could use it at all, while naphtha has a greater gravity and is almost as rich in carbon, and can be handled very much better.

Mr. Gwynn—I have used some benzine in enriching, and have made clear oil gas out of benzine. I would say the difference between that and good crude oil, used in the retort system on the Smith process, showed an average run of 81 or 81½ feet to the gallon of crude oil, while the benzine ran down as low as 60 feet to the gallon.

Mr. Persons—Do you know the gravity of the benzine?

Mr. Gwynn—No; I could not say as to the gravity. But it was the ordinary run of benzine.

Mr. Persons—That would have a gravity by Beaume of 70° to 74°.

Mr. Gwynn—I remember now that it has a gravity of 72°. It was used for gasoline lamps on the street. If 56° gravity had been used, it would have been a little better.

Mr. Persons—In refining crude oil a very small percentage is taken off in the form of vapor and condensed. Of course it is very light and very volatile, and while used in a great many places for gas making purposes, particularly with some oil gas processes, it is used with very low heats indeed. And even by using it with low heats, they will obtain tar and lampblack, because they cannot regulate the heat unless they use natural gas. Natural gas can be used and regulated in that respect.

Mr. Gwynn—Isn't benzine in a great many localities used simply for making lampblack?

Mr. Persons—Yes, sir.

Mr. Milne—My experience with the use of oil and benzine as an enricher for coal gas is very limited. My water gas experience has been wholly with the McKay-Critchlow process. I agree with Mr. Miller that the superheating surface in that apparatus is small, and will not handle crude oil so well as other processes having greater superheating surface. As to the results of crude oil and naphtha, I cannot give figures as to their relative value; but I will say that the McKay-Critchlow apparatus handles the naphtha very well, and we can make good gas with it. But I have always contended that the superheating surface was too small. I think that is the case with any water gas system where the generator and superheater are in one shell.

A vote of thanks was extended to Mr. Miller for his paper.

Preliminary Report of Committee on Memorials.

The Chair now called for the report of Committee on Memorials.

Mr. McDonald—Mr. Faben, who is Chairman of that Committee, left the matter in my hands. After consultation with the Secretary of the Association we decided to report to the Association the fact that we would prepare a suitable memorial and give it into the hands of the Secretary in time to be published with the proceedings.

The report of the Committee was adopted, and a recess taken until 2 P. M.

Second Day—Afternoon Session.

Report of Committee on Tar.

Mr. Gwynn submitted the following report from the Committee on Tar:

The Committee on Tar think it advisable for the present to recommend the appointment of a standing committee for the ensuing year, with authority to investigate and ascertain what a tar refinery would cost for the manufacture of pitch for electric lighting carbons, and to communicate with the different companies throughout the State to ascertain if they would co-operate in the matter of establishing a central tar refinery, and subscribe to the capital stock of such refinery in proportion to the capital stock of their respective companies.

The report of the Committee was then adopted, and the President appointed the following members as the Committee on Tar: Messrs. Butterworth, Penn and Cline. On motion, Mr. C. H. Welch was added to the committee.

Mr. Gwynn then read to the Association the following paper on

THE PRESENT AND FUTURE COMPETITION BETWEEN GAS AND ELECTRICITY.

The above subject was assigned me by the Executive Committee of the Ohio Gas Light Association, and at the urgent request of our worthy Secretary, I consented, against my own judgment, to prepare a paper on the subject. My reasons for objecting were that I did not consider it a proper subject to come before a strictly Gas Association, and last, but not least, my grave doubts as to my ability to add anything to what has already been written in papers read before this Association some years ago. I feel confident that the subject as treated will not please what is termed strictly a gas man, as his whole heart, soul and energy, if he is a wide awake gas manager, are bent upon his gas business; and as most of you are aware, everything in the illuminating line is inferior, unreliable and impracticable as compared with gas, that is, looking at it from his standpoint. But none the less, electricity is in our midst and with its rapid strides is advancing with unparalleled rapidity in all directions. Never in the history of the civilized world, has any one invention or discovery made the rapid strides and advancement that has electricity. It has been and is being daily pushed by unlimited capital and energy. As I stated at our Dayton meeting several years ago, electricity has come to stay, and my advice to all live gas managers, is not to follow in the footsteps of Rip Van Winkle, but to wake up and take hold at the helm and be at your posts, ready to meet all emergencies as they come, and be in shape to give the public whatever kind of light they demand. That electricity is a full fledged competitor of gas in all that the word implies, I think there can be no doubt. It has, practically speaking, an unlimited field to fill and more opportunity for rapid strides and advancements than has gas; and while it has some disadvantages to gas, looking at it from an illuminating standpoint, yet, on the other hand, it has some advantages over gas.

In order to get at the inwardness of both branches of the industries, and to treat them fairly from an unbiased standpoint, and produce a paper based on actual facts and figures, and not one written from my own views on the subject, I communicated with upwards of 200 gas and electric companies in different parts of the United States, in order to obtain as reliable data as possible on the subject to be treated. In order to give each one opportunity to consider the subject for himself, and to rely on his own judgment as to the best course to pursue in the future, I append a few figures in order to fully show the advancement of both branches of the business. To show the rapid advancement of one branch of the electric business, which is arc lighting, I append the following figures, showing the growth of the carbon business. Upon the introduction of the arc lighting business, from the year 1879 to the year 1881, only a small amount of carbons was manufactured, and from what data I can obtain the total sales of carbons would not exceed one million per annum, with price ranging from $120 to $150 per 1000. From 1881 to January 1st, 1892, the amount of carbons manufactured and sold in the United States has gradually increased, until to-day there are upwards of 145,000,000 of carbons being manufactured and sold annually, with price ranging from $9 to $10 per thousand. From the above figures, it will be seen that the arc lighting business has shown an average advancement of over 12 per cent. per annum for the past 12 years. While the arc lighting business has shown a rapid advancement for mainly public lighting, what effect do we find this has had upon public lighting by gas companies? To-day, out of over 928 gas companies in the United States, we find of that number only 435 have contracts for street lighting, and 493 have lost the street lighting business entirely, which has been displaced by arc and some few incandescent lights. While, on the other hand, a great many of the gas companies who still do street lighting, do only a limited business in this line, as street lighting by gas is being gradually displaced by electricity and will eventually be a thing of the past. Let us again consider the two great competitors from a commercial lighting standpoint, and what are the results? The aggregate gain in output of 27 gas companies for the year 1891, is 6.56 per cent., and for the year 1892, 6.61 per cent., or a net gain of 13.61 per cent. for the output of 1892 over that of 1890. For comparison, I will now show the aggregate gain of the commercial electric lighting business. In 1891, the aggregate number of incandescent lamps then installed by 14 electric companies was 16,475, and in 1892, the aggregate number of lamps then installed, had reached 33,238, showing a net gain of over 100 per cent. in the past year. From the above figures, it will be plainly seen that the net increase of commercial incandescent lighting for the past year over gas is 93 per cent. In addition to the incandescent lighting business of the above electric companies, I find that, in 1890, they had then installed 1,047 commercial arc lights, and in 1891, they had increased to 1,149, and in 1892, to a total of 1,620 lights, showing a net gain in the past two years of over 54 per cent.

Again, let us look at the lighting question. It has been claimed by most gas managers that electricity could not compete against gas for day lighting, as the business was not sufficient to justify an electric company to operate day circuits only in large cities. In this respect, I wish to say they have been mistaken, for I find that quite a number of electric companies, in cities of 20,000 population and under, are operating day circuits, or, in other words, are operating their plant for the full 24 hours. I am asked how they can afford to operate a day circuit without continual loss. I wish to reply to this question by saying, that in addition to what lights are required, the constant demand for ventilating fan motors, from which a good revenue is derived, enables an electric company to operate a day circuit at a small profit. To give you an idea of the growth and prosperity of the ventilating fan motor business, which is being rapidly introduced by electric companies, I append a few figures obtained from the manufacturers as to the sale of fan motors for the years 1891 and 1892. In 1891, the sale of fan motors, by four of the principal electric companies, was 2,012. In 1892, the sale of fan motors by the same companies was 5,093, and the companies above referred to stated in their report to me that for the present outlook, the sales of fan motors for the year 1893 will be 50 per cent. greater than for the previous year. In order to further enlighten you on the possibilities of electric companies operating day circuits, I wish to call your attention to the following figures showing the enormous increase in the sales of motors used for isolated purposes and independent of street car use. In the year 1889, the sales were, practically speaking, nothing, as the reports obtained show an aggregate sale of 175 horse power. In 1890, the aggregate sales of motors of five of the principal electric companies show 6,584 horse power. In 1891, the aggregate sales of motors by six of the principal electric companies were 9,657 horse power, and for the year 1892, the aggregate sales of seven of the principal electric companies were 19,216 horse power; or, in other words, the total sales of motors for the past three years, by seven of the leading electric companies, show an aggregate of 35,457 horse power. This branch of the business, if you will stop to think, comes in competition with the gas engine business, and while I have no figures to show the aggregate horse power of gas engines sold for the same period, yet at the same time, I venture the assertion that 25 per cent. of the sales of motors would be a fair estimate for the sales of gas engines. This branch of the motor business, looking at it from an electric standpoint, is not as easy to handle nor possibly not as profitable as is the gas engine business to gas companies. While the gas company can furnish the gas required for gas engines through the same line that is used for illuminating purposes, and without increased expense, it is impossible for electric companies to furnish current for motor use from the same circuit used for lighting. As I stated above, fan motors can be operated on the electric lighting circuits, but when an electric company undertakes to operate anything larger than fan motors from a lighting circuit, the continual stopping and starting of the motor will cause a variance in the lights.

There is no doubt but that electricity has made rapid advancement over gas in the past, and while it will continue to advance possibly more rapidly than will gas, yet, at the same time, in the future, the advancement will be somewhat checked as the novelty has worn off. On the other hand, the continued improvements, which are many and great in electrical appliances, will continue to make the electric business more simple and reliable, and will still

hasten its progress rapidly on for some years to come. In conclusion I wish to make mention of a few facts that may be of interest to gas companies. My advice to all is to stand firm and push your business with all the vitality that you have. Strive to make as good a quality of gas as is possible at a minimum cost, and sell at the lowest price possible to give a fair return on the capital invested. Again, let me urge upon you the necessity of pushing your gas heating and cooking business as rapidly as possible, as this is an almost unlimited field for gas companies, and one that is not likely to be disturbed in the near future, by your co-competitor, the electric light company.

Discussion.

The Chair—This is a subject which strikes right at the root of the gas business. Mr. Gwynn has made some very radical statements and gathered some very valuable statistics. Any information that can be given by the members we would be glad to have furnished us. The subject is now open for general discussion, and I am sure that Mr. Gwynn will be pleased to answer any questions that may be asked him.

Mr. Nash—I am glad that Mr. Gwynn still has hopes for the gas business. Notwithstanding the fact that there seems to have been no material reduction, yet at the same time it has not increased as fast as electricity. Still, the result has not been so bad with an average advancement of over 12 per cent. That is considered a pretty fair advancement in ordinary business. Still, as compared with electricity, it does not seem to be very much. The electrical business, no doubt, has made wonderful strides. This is called the electrical age, I believe; but look at the methods that have been employed to push the electrical business. I will call the gentleman's attention to that. The gas business has been conducted in an honorable kind of a way, and I don't think the other has. I think that is one reason why the sales have run up so. When a man can sell two electric plants in one town and a gas company would not think of having but one gas works, it makes some little difference. I think in one place he states that half of the gas companies have lost their street lighting.

Mr. Gwynn—Over that.

Mr. Nash—I think in almost every case that does not result in the decrease of consumption. I know of a number of instances where they have been glad to lose the street lighting, for they have done it at no profit—they did it at cost, and it relieves them simply of a municipal contract that is a source of uncertainty and expense, especially every time the contract had to be renewed. Of course the place makes a difference as to how much the cost is for renewing a contract, but nevertheless, I know it to be a fact that a number of gas companies have felt that they would not take street lighting again if they had the opportunity to do so.

Mr. Gwynn—You have the percentage of gain of the gas companies too great. The aggregate amount of gain in output of the 27 gas companies for the year 1891 was 6.56 per cent. instead of 13. The per cent. you speak of, 13.61, was for two years, 1891 and 1892.

Mr. Nash—What I quoted from, I guess, was the per cent. of arc lighting business.

Mr. Gwynn—If I had taken the trouble to select certain years it would have shown that the arc lighting business had advanced over 40 per cent., but this has been the average advancement since 1881.

Mr. Douglas—Wouldn't it also be fairer to take the average advancement of the gas business from its earlier stages down to the present time? The advancement in the earlier stages of the gas business was probably as great as in the electric business in its earlier stages, and the comparison does not seem fair, for that reason.

Mr. Gwynn—I beg your pardon; the advancement in the gas business in its earlier stages would not compare with the advancement in the electric lighting business. I would like you to point to the gas business that shows an average advancement of 12½ per cent. right straight through for 13 years. That has been the average advancement in arc lighting alone, saying nothing of the gas company's heavier competitor, the incandescent electric lighting, which shows an average advancement for the year 1891 of 93 per cent. over gas. Now, had I gone back further into incandescent electric lighting—as you will notice I only took the year 1892, and not 1890 and 1891 as I did on the gas side—it would have shown an advancement of 127 per cent. over gas. There has been no gas business which has advanced as rapidly as electricity.

Mr. Wm. McDonald—There is no calculation so misleading, Mr. President, as the percentage calculation. And I think we are sometimes misled by these percentages and the calculation of percentages. Now, the gentleman shows that the percentage of increase in electric lighting is very much larger than the increase of gas. Let us suppose that an electric plant only had one light at the beginning of the year, and that at the end of the year it had two lights, under the percentage calculation there would be a percentage increase of 100. I speak of this only to show that you cannot get at any definite comparison of increase in the two classes of lighting, unless you produce statistics showing the entire amount of the business of each. I think if it were shown up clearly it would be found that the gas business has increased, even in the State of Ohio—I do not know so much about Ohio as I do about some other States; but in the State of New York I know it would show that gas lighting had increased very largely in excess of the increase of electric lighting, however it may be in Ohio. Now take the volume of business on that basis and calculate the percentage of increase, then you will see how rapidly the two are increasing in comparison. I only call attention to this fact because these comparisons of percentage are very deceiving things.

Mr. Faben—Mr. McDonald came very near stealing my ammunition. Our friend, in presenting his paper here, calculates the increase in the electric lighting upon the basis of the number of lights, and calculates the increase in the gas business on the volume of the output. Now, if we had the number of gas jets which have been added as compared with the number of electric lights added, we would strike very much nearer the true proportion of increase. In his calculation every additional lamp is counted as increase; whereas, in the ordinary station, the unit of horse power may be very small per lamp, and yet it may show a very high rate of horse power per lamp compared. One of these stations may use the meter system, measuring the quantity, and the other lamp be taken in hours.

Mr. Gwynn—The figures used, to show the advancement of electric lighting, were not derived from stations where meters were used. The figures were taken from stations operated on the contract system and lamps sold at so much per month, and the price has not been varied for three years. Stations making me a report by meter, I paid no attention to, because I wanted to get at the actual advancement in dollars and cents, the same as is shown on the gas side, so that it is a good comparison with the output and growth of the gas business.

Mr. Faben—I do not agree with the speaker on that. If we had here the number of gas jets in use to-day compared with those in use one year ago, we would then have true statistics to calculate from. But you have a number of lights on one side and the volume of gas on the other. The volume of gas bears no relation to the number of burners in use. Of course, a house may actually use three burners or four, and yet have 30 in the house; but, then, in making his figures he used the increase in the number of lights to show the advancement in electric lighting, and figured on the increased volume in output to show the advancement in the gas business. It seems to me the proper comparison would be as I have suggested. If you compare the increase in the volume of gas to ascertain its advancement, it seems to me you should compare the increase in the volume of electricity used, and not the number of lights.

Mr. Gywnn—If the electric lights are not used when sold and you are getting pay for them what difference does it make? If you have 30,000 lights and get $1 apiece from them, whether they are used or not, you are taking in the money over your counter, just the same. I have figured the percentage of increase in both cases on the basis of dollars and cents taken in over the counter, which shows the per cent. of increased earnings on both sides.

Mr. Faben—I won't attempt to speak with reference to the companies Mr. Gwynn has compared in his estimate here; but I know of incandescent companies furnishing incandescent lamps for $1.25 a month apiece, and they have customers on the line where they furnish six incandescent lights for $1. So that you cannot take a number of lights and put them in at a dollar apiece and establish a fair comparison.

Mr. Gwynn—I know nothing of that case. Mr. Starr might be able to tell something about it.

Mr. Faben—Mr. Starr is not here to defend himself.

Mr. Gwynn—I understand that is the way he does in Richmond, Indiana.

Mr. Faben—I do not refer to him at all, but I know of some companies that do this.

Mr. Gwynn—But these companies I speak of are running strictly at a fixed price. A great many companies are not. I know how these companies are operated. I know personally of the electric light companies I speak of, and most of them are operated by gas companies, and, therefore, have no reason to cut prices, and you know the gas companies that enter into the calculation; you know them well. They are prominent gas companies throughout the State, and the percentage shown is the average increase in their business in dollars, the same as is shown in electric lighting.

Mr. Faben—Ours is more than 13 per cent.

Mr. Gwynn—The gain in the output of 13 companies who have opposition incandescent electric light plants as competitors, was 7.1 per cent. in 1891 over 1890. The gain in the output in 1892 over 1891 was 6.5 per cent. The net gain in the output of the 13 above companies, in 1892 over 1890, is 14.18 per cent., and the gain in consumers in 1891 over 1890, was 7.2 per cent., and in 1892 over 1891, 5.7 per cent. As you will see, the gain in the number of consumers is less than the gain in the output in the year 1892 over 1891, so that it shows that a part of your increase in output in gas was sold to old consumers, and not new business derived as in the case of electricity. You were not making your percentage of gain on new consumers, as in electricity. The decrease in the price of gas, in 1891 over 1892, of 13 companies, was 3.85 per cent. That is, they took in that much less money over the counter. Decrease in price of gas, 1892 over 1891, of 13 companies, 1.27 per cent. Net gain of 13 companies, from 1890 to 1892 was 9.60 per cent. That was the actual gain in those two years of income in money over the counter, and while they have gained, as I have shown, 14.18 per cent. in output, in order to do this, they have reduced the price, and have only gained 9.60 per cent.

Mr. Faben—I think that the figures presented are still warped. If you are going to take the price of gas and the number of consumers, and what each consumer has used, you better take the balance sheets of the company and show who divided the most dividends in those two years.

Mr. Gwynn—I was just showing you the figures in order to ascertain whether the gain in output which was made in the gas business was actually from the new business or whether the increase in output was not from consumers that you formerly had. The profits don't enter into the discussion; the question is, is the electric light a competitor?

Mr. Faben—I don't want to enter into any discussion on the matter. I wanted to point out that your figures based on the percentage are a little misleading. If you are given the volume of gas you should also compare it with the volume of electricity, and not the number of lamps. If you are to compare it with the number of lamps, then I think you should take the number of gas burners used. If we are going to take the increase in the number of consumers, the increase or decrease in the quantity used per consumer, and the decrease in the price received for the gas, I think you ought to take the same figures with reference to the other side, and then go a little farther and strike the two balances to see what profits were divided in the gas business as compared with the electric business.

Mr. Donald McDonald—I would like to inquire if you don't think it would be fair to consider the fact that nine out of every ten houses in any ordinary city are already piped for gas and already burning it, and not one out of every ten is already wired for electricity, so that one is working in a brand new field and the other industry can only draw its increase from new houses and gain in the population.

Mr. Gwynn—A great many of the electric light companies that I speak of have been in existence, according to the report, since 1884 and 1885, and show in their earlier days, as Mr. McDonald has suggested, a great deal larger increase than this paper has shown. For that reason I think the comparisons I have made are fair. He says if you started out with the time when incandescent lighting was inaugurated, or when they had but one light, then when they put in the second light it would show a gain of 100 per cent. For that very reason I didn't go back to the starting years, because I didn't regard it as a fair comparison. But if I had, it would have shown a much larger increase over the figures named. In one case, in one of the large cities of Ohio, an electric company started in December, 1890, and in that month, they put in 1200 incandescent lights on contract at 75 cents each, and they show a business in January, 1892, which was one year later, of 9,500 lights. What kind of an increase would you call that if you took that single company as a basis? While that is one instance there are companies included in this list that show an actual loss in the business done a year or two ago. So that this average gain of business which I have referred to included those companies that have increased as well as those that show a decrease in business, so the comparison is a fair one.

Mr. Donald McDonald—The point I wish to make is with reference to the comparison of two kinds of business, one of which is comparatively new, and the other has been established for sometime, where nine out of every ten houses are already piped for gas, and not one out of ten is prepared for electricity. I claim that where nine out of every ten houses are already prepared for gas and already using it, it would be unreasonable to expect the percentage of increase which would be found in a business comparatively new. When the times comes, if it ever should, that nine out of every ten houses are wired for electricity and already using it I do not think they can maintain the 93 per cent. he refers to. It would be unreasonable to expect that percentage of gain. Yet you are comparing that with the average gain in the percentage of gas companies. After the demand has already been supplied, and when everybody has got his house piped for gas, there remains no new field for the gas man to explore, except from gain in the population.

Mr. Gwynn—There is a new field in the growth of a town, and the electric business is not new as Mr. McDonald says, for it has been in the field about 15 years.

Mr. Donald McDonald— Does anybody build a house that doesn't pipe for gas?

Mr. Gwynn—Yes, at the meeting in St. Louis of the National Electric Light Association there were pointed out to us a number of houses, and high priced ones too, where there was not a pipe put into them for gas, but they were simply wired for electricity.

Mr. Donald McDonald—Aren't there ten houses piped for gas where there is one wired for electricity?

Mr. Gwynn—Most all of the good houses that are constructed to-day are wired for electric light, and also houses that only take five lights, as the gentleman I referred to showed us houses in St. Louis that had not a foot of gas pipe in them.

Mr. Donald McDonald—I have supervised the building of 200 residences in one capacity and another, and I believe that out of that 200 but five were wired for electricity; and all the 200 were piped for gas. That is the way it works with us.

Mr. Gwynn—Of course you will understand that the object of this paper was not to show the advantage of electricity, but simply to treat of the present and future competition between gas and electricity. It has been held by a great many straight gas men, as I will term them, that the advancement in the electric lighting has not at all interfered with their business. If you ask them: "Is electricity hurting you?" they will say, "No, we are getting more business than we ever had; it is not hurting us a bit." Where are they getting all their business from? Where do the electric light companies get all their business from? Some of it must certainly come from former consumers of the gas companies, and from sources that the gas company would derive new business, if electricity were not a competitor. Here are some further reports from Ohio beside what I have already referred to. These are figures which I have obtained since this paper was written. Gas engines operated in 1890, by 13 companies in Ohio, 114; in 1891, 117 engines; in 1892, 114 engines. Now, in showing the fairness of this estimate I will state that I have left out entirely from my calculations places where natural gas has displaced the use of artificial gas in this respect. I have not taken a place in this calculation where natural gas had entered into the question, but simply discontinuance or check of growth through some other source, which is beyond doubt, the electric motors. The increase of gas stoves in 1891 for 13 companies was 20.4 per cent. Now you will see that this increase is large, and the larger portion of the increase in business of gas companies was not from lighting but from gas stoves, as the gas stove business shows an increase of 20.4 per cent. as compared with an increase of less than 7 per cent. for all purposes. In 1892, the increase in gas stoves of the 13 companies was 28.1 per cent. The average gain in stoves for the year 1892 over the year 1890 was 46.6 per cent. So that the increase in the gas business may be attributed to the gas stove trade and not for lighting purposes. The gain in the output of 6 gas companies who don't operate anything but arc street circuits, with some few commercial arc lights, and who have no incandescent electric light competitors, for the year 1891 over the year 1890, is 13.1 per cent. Gain for 1892 over 1891, 11.4 per cent. Gain of the six companies for 1892 over 1890, 26.3 per cent., or a net gain over companies that have an incandescent electric light competitor of 12.69 per cent; or in other words, about double the percentage of gain in their business. So you can see how the incandescent electric lighting companies are affecting the gas companies' lighting business when in competition. The increase in consumers for the year 1892 over 1890 for the above six companies, was 21 per cent., or a net gain of over 8 per cent. more than gas companies that had incandescent electric light companies as competitors. Seven companies in Ohio do less business for the year 1892 than for the year 1890; and why? Simply because they have had heavy competition from arc and incandescent electric lighting companies. The seven companies above referred to are not only doing less business, but are receiving a less price per 1,000 for the gas sold.

Mr. Miller—There is no question about the fact, as Mr. Gwynn says, of there being a broad field for electricity. Electricity is a form of energy, and, therefore, cannot strictly or properly be compared with gas. We are only interested in it, as far as it comes into our field for lighting and for power. It is hardly necessary to mention heating, for it is so expensive that it will not do to use it for that purpose. I remember an instance where a gentleman wanted to heat a coffee urn with electricity, it being so situated that he could not heat it handily in any other way, and it took a 10-light converter to heat an ordinary coffee boiler. I believe it is generally accepted as a fact that it is too expensive, so it is hardly necessary to discuss that feature. But when it comes to the question of improvements, I take exception to what Mr. Gwynn says. In the first place, we must have some motive power to generate our electricity. We are at the present state of the art, dependent upon the steam engine. The steam engine will never be theoretically perfect until we can arrive at some scheme to get the latent heat of the steam. We can expect very little further improvement in that direction. Going on a step further, we have the dynamo. The dynamo will develop an efficiency of over 90 per cent. From the dynamo we must come to the lamp. In over 10 years use the incandescent lamp has not been improved upon, and electricians give us no promise of any improvement in the use of the incandescent lamp. Figuring on that basis, there is no prospect of any reduction in the cost of incandescent lighting. As to arc lighting I have but little to say. It is a good thing. It has a field of its own. It will continue to have a field of its own. Electricity has come to stay, without any question; but as to their being able to cheapen incandescent lighting, so as to sucessfully compete with good and cheap gas, there is apparently, as far as can be told by electricians or any one else, no hope of it. On the other hand, let us see what hopes there are in gas. The efficiency of a 17 candle power gas flame is one-half of one per cent. The efficiency of that burner (indicating), which is a modern thing, assuming it to give 21 candles to the foot—I believe it only gives 19, but I take 21 because it makes the calculation easier—would be just three per cent.; therefore, we have 97 per cent. to go on, and so we have some hopes of improvement in that direction, whereas electricians give us no hope of improvement in incandescent lighting.

Mr. Wm. McDonald—As I said before, I hadn't very much familiarity with the condition of things in Ohio, except that which I have heard here in this Association, but I have some familiarity with affairs and companies in electric lighting in the State of New York, which I think will interest you all. During the past year, if I remember right, the electric light companies gained something between two and three thousand consumers in the city of New York, which was undoubtedly a very large gain, but when we stop to think that at the same time the gas companies in the city of New York gained between 25 and 30 thousand consumers, it seems to me the comparative increase of electricity alongside of gas does not seem so very wonderful.

Mr. Gwynn—The electric light business is checked in New York by the enormous charges made by the Underground Conduit Company, or else it would show a more rapid advancement.

Mr. McIlhenny—It may be interesting to state in connection with

the subject, the results of a test recently made in a large hotel as to the different costs of the different forms of lighting. For 24 hours, or one complete day, with their own incandescent plant, the cost of coal, running for that 24 hours, was $4.38. That did not include a helper, oil, wear and tear, or any other expense whatever. The following 24 hours the hotel was lighted by gas, and the entire cost for the entire time was $4.75. On the third day, the light was taken from the works of the local incandescent company and measured through a meter. The expense that day was about $11.50. That certainly is a remarkable showing for gas. On the question of the future competition between gas and electric light, it may be well to state that a circular was issued about a year ago by a prominent investment house in Boston, Mass. After dealing with various forms of securities in which people should invest their money, it dwelt a little upon gas and upon electric light. It said that gas was supposed, for a long time at least when electric light first came out, to have lost strength, but it has demonstrated its capacity as a dividend earner, and investors are again turning to it with willingness and are ready to put the desired amount of capital into gas enterprises. I should add that with reference to electricity, it stated that the expectations of the electric light suppliers have not been met. Few companies have paid dividends, and investors are timid about putting their money into such plants. That was from an entirely impartial view, and certainly goes toward strengthening the confidence of the people who are engaged in the gas business. I think they may feel that there is no uncertainty, so far as we can tell at this time, nor will there be in the future, unless something radical is done to cheapen the cost of electric light. I do not think that the gas people should fear at all. We have seen in every city in the country, where the fight has been made with gas, that gas has held its own. I know of one town where the gas business, for various reasons was not pushed for several years, the price being kept at $2.30 per 1,000, and there was actually no attempt whatever made to increase the business over that which they had. On the contrary, the electric lighting business was pushed and everything was done to increase their business. At the expiration of that time the gas company even in that town was holding its own. No dividends were paid, but no money was being lost—the company was coming out just about even; whereas, the electric light company not only had never paid any dividends, but was increasing its bonded indebtedness. So I think, unless there is some radical change made whereby electricians can obtain more efficiency from steam and carry that efficiency to the electric light burner, we need have no fears whatever in the gas business.

Mr. Stephens—I think that the comparison that Mr. Gywnn makes is not as fair as he intended it to be in one respect. In our locality we have an incandescent plant that is supposed to have been installed for 1,500 lights. I presume, in the statement of business, the equipment of the plant would be rated as a 1,500 lamp plant, whereas, in actual service, I doubt very much if they have half that number in use. Consequently, the criticism in regard to the comparison, or the data of comparison, will probably lie against Mr. Gywnn's statement with considerable strength. I think in our own locality we have held our own fairly well, and have been doing as well under the competitive conditions that we have as we can expect. At the same time it is quite well known that the opposition company is barely holding its own, if that.

Mr. Seamon—I would like to add a few remarks on this subject by stating that at Uniontown, Pa., we put on some 70 of the Shallenberger meters, made by the Westinghouse Electric Company of Pittsburg. We charged at the rate of one cent. per hour, with a discount of 25 per cent. off bills that were under $10, and an additional discount, making 35, if bills were over and above $10, and a special rate to the hotels of one-half per cent. per ampere hour. My opinion is that the only way to make an electric light plant dividend paying is by the meter system, to do as we do in the measurement of gas. We found that when we added these meters the maximum ampere hours at our plant before we added the meters was about 50, which Mr. Gwynn will understand, in the Westinghouse system, is equivalent to the capacity of the plant. The minimum was about 25. We run day and night. The meter system we have at Uniontown is successful. We have found that our income has increased about 10 to 12 per cent., and we have reduced the greatest expense, that of fuel. Our plant is paying, and paying largely, because we get fuel very cheap, exceptionally so, or at the rate of 60 cents per ton, slack coal—I believe the cheapest in the United States.

Mr. Faben—I would like to ask Mr. Seamon what the output in the amperage is now compared to the time when selling on the open rate.

Mr. Seamon—The minimum in the day time is about 10 amperes. The maximum, between six and nine o'clock, runs up to about 48. The minimum before we put the meters on was about 25 and the maximum 50. We found that the consumption in the day time was what was taking away the profits.

Mr. Faben—25 and 50 were the extremes before, and 10 and 48 are the extremes now?

Mr. Seamon—Yes.

Mr. Faben—That brings us back to the proposition I started out with. The ampere hours show up very handsomely in figures representing the electric light business, but I still maintain that the comparison is not a fair one, and for a good reason. I had occasion last year to get some business on account of an accident to the electric light plant in our place. It was in the summer time, and they were required to burn gas instead of electric light, and they burned gas only as long as they had to, and then took the electric light as soon as they could, for the reason that their electric light cost them $15 a month, and the gas cost about $45, in the middle of the summer.

Mr. Gwynn—Did that include the day circuit?

Mr. Faben—They could use it 365 days in the year and for 24 hours in the day.

Mr. Gwynn—As I have said from the beginning, the figures used by me in the comparisons were from the actual amount of money taken in over the counter, on the night circuit. There is no day circuit included in this estimate at all. This shows the percentage of gain in the electric business based on the dollars and cents taken in over the counter against the dollars and cents taken in over the counter of the gas companies, during a similar period.

Mr. Faben—You have taken the percentage of the gas output.

Mr. Gwynn—I have taken the percentage of gain for the years named on the entire income over the counter in dollars and cents, and you get the advantage of whatever increase there is.

Mr. Faben—No, sir; because you are taking the volume on one side and taking the earnings on the other.

Mr. Gwynn—But you get the advantage of any percentage of increase the same in one case as in the other, for both are calculated on the same basis.

Mr. Seamon—I would like to add one instance. One of our consumers was paying about $11 per month (between $10 and $13 I can safely say), but when we put a meter on for him his bill was $40, with the discount of 25 per cent. off. That was for the month of January. There was considerable kicking, I must say, and I may add that I am glad that I am living.

Mr. Miller—Is that man still burning electric light?

Mr. Seamon—Yes, he is still burning electric light. Because we have both gas and electricity, and he is compelled to do one or the other.

Mr. Wilkiemeyer—The paper just read is a most elegant compliment to the energy and ingenuity of the electrician. It shows that the electrical man knows how to put in his apparatus, and knows how to sell his supplies. What we get out of them is immaterial to him—that comes after a while. Now, as to the increase given by Mr. Gwynn; if the gas companies should do their piping free, put in their burners free, as the electric light companies put in their wires and lamps free, it is reasonable that they would make an increase on that basis.

Mr. Gwynn—Before the discussion closes I want to call attention to another matter, in regard to the heating. In winding up my paper you will notice that I called particular attention to the heating business. I think that Mr. Miller spoke about that also.

Mr. Miller—Yes, I said it took a 10 light converter to heat an ordinary coffee boiler.

Mr. Gywnn—In that connection, let me say I wrote to a prominent electric company, asking for some information in regard to a heater sufficient to heat an office which we were then occupying. In reply I received this information: "These heaters are meeting with favor among the electric light companies. For a room the size you speak of we would suggest one of our No. 3 heaters. A four-plate heater in 500 volt circuit will take about 4 amperes of current consuming between 1,500 and 2,000 watts. One watt consumed will heat about two cubic feet of space. In ordering, do not fail to state voltage of circuit, and whether direct or alternating current."

According to the above figures it will require about four-horse power to generate the current to operate the heater. Taking the ordinary way of firing, it will absorb about 32 pounds of coal per hour with the ordinary boiler and engine appliance to generate steam sufficient to produce the power required to operate a dynamo to generate a current for heating the above sized room. So you can readily see for heating they are not in it with the gas companies. The gas companies, therefore, have an unobstructed and broad field, as I said in the closing paragraph of my paper, and need not fear the electric companies entering into competition so far as the heating business is concerned. By gas companies increasing their heating business, which will materially increase the output of gas, and, by so doing, they will be enabled so to reduce the selling price, which will tend to make them a sharper competitor of the electric companies from a lighting standpoint. The electric companies are not competitors of yours from a heating standpoint, but they are from a lighting standpoint. Mr. McIlhenny spoke in relation to the electric companies making no money. That is very true in some cases. Very few are making money; but, on the other hand, I wish to state there are a great many gas companies that I know of throughout the country that did not make any money when they first began to operate their gas plants. Some of them did not declare a dividend for 10 or 15 years, in fact, some of them to-day do not declare a dividend, but that does not cut much of a figure in this question. Electricity is here backed by plenty of capital, and it is going to stay and be your competitor in lighting. Improvements are being made so that the expense may still be further reduced. Mr. Miller (I think it was) said that there had been no improvement in the electric light appliances for some time, and electricians gave no promise of any such improvements in the future. In reply, I may say that if Mr. Westinghouse's statement is correct, and he is pretty good authority, his new lamp, which he claims is a success, will very materially reduce expenses, and will cut a big figure in the incandescent lighting business.

Mr. Faben—Has anyone seen any of those lamps?

Mr. Gywnn—I have seen them, and they worked very satisfactorily, and have about 33 per cent. more efficiency than the ordinary lamp that is burned to-day. In other words, you can take a 10 or 11 hundred light dynamo, and run about 1,450 of the new Westinghouse stopper lamps and not show any more amperage than with 1,100 of the ordinary lamps; or, in other words, you save about 33 per cent. current with the new lamp.

Mr. Faben—That is his claim for those lamps?

Mr. Gywnn—Yes, that is his claim. While they are not in general use, as I say, if you take his word for anything, they are going to cut a big figure in the electric light business. It makes a very fine light. In looking at them you would take them for the ordinary lamp, and pass them by without giving them special attention. Of course they will make a material decrease in the price of renewals, as they can be furnished to you at a great deal less money than the ordinary lamp. You can buy them for 27 cents apiece net. That is the Westinghouse stopper lamp.

Mr. McCall—Where do you buy them?

Mr. Gywnn—You will see Mr. Westinghouse's advertisement in most any of the journals; but I understand they are so far behind with the orders that they will not promise to furnish any for a certain period in the future.

Mr. McCall—I don't want to know about the advertisement, but where do you buy the lamps?

Mr. Gwynn—You will have to buy them of the Westinghouse people. They claimed to me they were so overwhelmed with orders that they have not been able to keep up with them and, therefore, cannot fill orders promptly at this time.

Mr. McCall—The reason I made the inquiry was, I have had an order in since December for those lamps for sometime and have not been able to get it filled.

A Member—Have you received any lamps yet?

Mr. Gwynn—No; but I understand they are manufacturing lamps for the World's Fair, and want 135,000 to install in that plant first. They are holding all the lamps they manufacture for that purpose.

Mr. McCall—I have heard so much of the lamp and so many excuses that I wanted to get at the bottom of it.

Mr. Miller—I know of one man that offered to give $50 for one of those Westinghouse lamps, and that has been a standing offer for over two months, and he has not got it yet.

Mr. Gwynn—I have a report from one gentleman who states he has tested them in his own incandescent lamp works, and says that the efficiency of the lamp is excellent, and it is only a question as to the life of it. He says there has been no question about the efficiency at all, but it is only a question as to the life and number of hours it will burn.

Mr. Miller—That is a very important thing.

Mr. Seamon—I would like to state that I have seen it in operation and had the honor of having it shown to me by Mr. Westinghouse himself in connection with the President of our Company, Mr. Ewing, and my opinion is (while I do not claim to know much) that there cannot be a cement made which will secure a perfect vacuum. There is no cement known yet that would make a perfect vacuum—that is at the point where the stopper is united with the bulb. I don't think a perfect vacuum can be formed in the lamp, and I think that is the reason why it is not general on the market to-day.

A vote of thanks was then extended to Mr. Gwynn for his paper.

ELECTION OF OFFICERS.

The report of the Committee on Nominations then being called for, the following was submitted:

Mr. President—The Nominating Committee beg leave to report the following nominations for officers for the ensuing year:—

For President—Irvin Butterworth, of Columbus,
For Vice President—J. W. R. Cline, of Springfield,
For Sec'y and Treasurer—A. P. Lathrop, of Columbus,
For Members of Ex. Com.—Geo. W. McCook, of Steubenville,
H. L. Hurlburt, of Oberlin.

Very respectfully submitted,

J. Gwynn,
C. R. Faben, Jr.,
W. W. Prichard,
} Committee.

On motion of Mr. Persons, Mr. Hayward was instructed to cast the ballot of the Association for the candidates nominated by the committee. Mr. Hayward then cast the ballot of the Association, and the members above named were duly declared elected to the offices to which they were respectively nominated.

Mr. Butterworth—Gentlemen, I thank you for the honor you have conferred upon me in electing me your President for the ensuing year. It is an honor to which I did not aspire. I feel that in asking to be relieved from the duties of the Secretaryship, I have jumped "From the frying pan into the fire," at least for one year. But I have the consolation of knowing that at the end of that year I can take my place in line among you as a working member, which I want to do, and shall do, if I live and am in the harness. I have been connected with the Ohio Association since its organization. I was present at the Park Hotel, in this city, in 1884, when the charter members met and organized the Ohio Gas Light Association. At the next meeting, in Cincinnati, I was elected Secretary, and by your sufferance and indulgence I have occupied that place since, to the best of my ability. I say that advisedly. I have had my heart in the work of the Ohio Association, as I shall have it hereafter. I thank you again, gentlemen.

NAMING PLACE OF NEXT MEETING.

The President—There has been no action taken this year in regard to a future place of meeting. It was partially understood last year that the invitation of the Columbus Gas Company, to adopt Columbus as a permanent place of meeting, would be accepted.

On motion of Mr. Shelton, the question of the place of next meeting was left in the hands of the Executive Committee, with full power to act.

An Explanation.

The Secretary—I would like to mention one matter before we proceed with the other business before the convention. Probably an explanation is due as to why there has been no exhibit of gas appliances in connection with this meeting. I may perhaps be excused for reciting a little bit of history with reference to the giving of exhibits in connection with our meetings in the past, and explain why an exhibit was not given this year. When the Association met at Sandusky several years ago, Mr. Wood suggested that some of the gas stove men should have a chance to exhibit some of their supplies, and we did have a very small impromptu exhibit, the gas company paying the expense, I think. The next year, at Mansfield, the exhibit was made more of a feature, and likewise at Toledo. At the Toledo meeting certain expenses connected with the exhibits were set apart which were to be borne by the Association. Those expenses came to be rather burdensome to the Association. Its membership was limited, the dues only $3 a year, and other expenses having increased (as for instance the proceedings being printed in pamphlet form), our treasury showed signs of depletion. The Executive Committee voted two years ago that there should be no exhibits of gas stoves, at least not under the auspices of the Association, or at their expense. The Columbus Gas Company, however, took it upon themselves to arrange for an exhibit, and did so, paying a large portion of the expense. As we are a natural gas town, and as we have had an exhibit here once, and especially as a great amount of dissatisfaction existed on the part of the exhibitors last year as to the result of their exhibit, some of them saying that as it did not pay them they were done with exhibits of that character in the future, it was concluded that we would not have an exhibit this year. Inquirers, however, were told that if any concern wanted to exibit stoves or any other appliances on their own account, we would be more than willing for them to do so, and some have made arrangements to make a small exhibit at the hotel. A good many members and persons connected with gas appliances have approached me at this meeting with the suggestion that the exhibits were a valuable feature of our meeting, by attracting members would make the meetings interesting and would increase our membership. So many have talked to me in that way that I have thought probably we had better make arrangements to resume exhibits at our future meetings. I would like to get the sentiment of the Association upon the subject, and also as to what arrangement should be made for paying the expense which would necessarily be incurred in making an exhibit; whether it should be prorated among the exhibitors wholly, or assumed in part by the Association. The Columbus Gas Company is ready to do its share if an exhibit is made here.

Mr. McCall—I move that the parties exhibiting their appliances do as everybody else does; pay their own expenses.

Mr. Penn—As there is no second to that motion, I move that this matter be left to the Executive Committee with power to act. (Motion seconded and adopted.)

Mr. Roper—I would like to correct a mistake that we find is made. There was a good deal of dissatisfaction last year (there is no question about that) among the exhibitors. Since I have been in the business there never has been as good an exhibit as was made in Columbus last year. But the matter of expense did not enter into it at all. I do not think any stove man or any other appliance man made any complaint as to what it cost them. That was not the ground of dissatisfaction. They did not complain of the cost, but they did complain that when they did make an exhibit, and had gone to an expense of anywhere from a $100 to $300 to make the exhibit, the Association passed right by paying no attention to them, and that it was in fact simply an exhibit for the town people and a lot of ladies and one thing and another that came in and took up our time and didn't amount to anything. The exhibitors would a great deal rather be out of the business than spending their time standing around talking to some curiosity seeker in an exhibit room, who would take up their time in making useless inquiries, when they would a great deal rather have been spending their time at the Association meeting. The expense has nothing to do with it. They did not care anything about that. I then suggested, I think, to Mr. Wilkiemeyer and Mr. Faben, and perhaps others, that if they made another exhibit I thought it would be no more than right that the Association should adjourn at some specified time to the exhibit hall, when the exhibit hall could be cleared of all the people that were in it except members of this Association, or of those who were here attending the convention, and that the exhibitors be given at least five or ten minutes to call the attention of the members to their exhibits; that the Association might visit the hall in a body, and have some one who had charge of the exhibit to introduce each exhibitor and give him five or ten minutes to say his piece. He could say more than he has got to say in five minutes, and let them go through in that way and let that end it. It was

the general opinion that if the Association would do that much for them, it would be all that the exhibitors would ask. Then they could come to the convention and attend its sessions, and then they would not have to be attending their exhibits all the time and talking, nine-tenths of the time, to some one whom they didn't care anything about, and who did not care anything for them, waiting to catch some straggler from the Association who might drop in. That was the opinion last year.

The President—I think the Association understands the attitude of the stove men, and I think last year there was room for complaint. The exhibit was good, but there was a great deal of work last year to be attended to by the Association, and no special provision was made for visiting the exhibit. I do not know that the most good would be derived from attending the exhibit hall in a body, but I should think each member ought to take time to visit and study it thoroughly, and in that way get the most good out of it.

Mr. Roper—I don't mean to go in a body, but that the Association should visit and inspect the exhibit. I don't want to spend all my time standing around among a lot of gas stoves with nobody to talk to except those who are not particularly interested in them. I would a great deal rather be in the convention hall, so far as I am concerned. I object to standing up among a lot of stoves waiting to catch an occasional straggler.

On motion of Mr. Persons a vote of thanks was extended to the Columbus Gas Company for courtesies shown the Association at its present meeting.

Back to the Question Box.

On motion, the Question Box was then continued.

The President—Question 8, "Is not power furnished by a gas engine the cheapest?"

Mr. Gwynn—It depends on the price of coal which you use for generating steam, and as to what kind of engine you have, whether a triple expansion or a compound condensing engine, and at what price you can produce your gas. I do not think that question can be answered by any one standard. You have to take into consideration local conditions.

The President—Question 10. "Why do not all meter manufacturers place the words hundreds over the right hand dial of meters, instead of 1 thousand, as some of them do?

Mr. Wm. McDonald—I do not know that I know why they do not, but I presume it has been done both ways, and finally it has been settled that it is better to put 1 thousand than hundreds because it confuses less people. It is 1 thousand around, and it seems to me as though anybody ought to understand what it meant. If you were to say hundreds over that, there might be more confusion I think than there is at present. I do not know of any other reason.

Mr. Lathrop—It seems to me as if it would be a great help to a majority of the people unaccustomed to reading meters, if they were marked the other way. In our own experience, last month, we had three cases in which there was confusion in reading the meters because the right hand dial said "1 thousand". One customer claimed that his meter was constructed so it did not register hundreds, and he thought that every time the index moved a hundredth point the meter registered him as using a thousand feet of gas, and he was very much excited over it. I assured him that the wheel had registered a hundred, although it did not say so on the meter.

Mr. McDonald—I think if that idea was carried out, and one hundred, or hundreds, put over the first dial and one thousand over the second and ten thousand over the third, it would occasion very much more confusion than the present method does, because people would argue that the last dial was ten thousand around, instead of one hundred thousand as it is. I think this matter has been carefully considered by the meter people and they have tried to make it so that there would be the least confusion. I think the other way would still be more confusing.

Mr. Lathrop—My idea was, for the meters to be marked, instead of "one hundred", "hundreds", the next dial thousands and the next ten thousands. That would be quite clear to anyone, because the first dial does not register one thousand. It registers up to nine hundred, and then goes to nothing, and the second dial registers one thousand, and so on up. I suppose the meter manufacturer would know more about this business than I do, but it seems to me it would simplify things if they were marked in that way.

Mr. McDonald—Do you think there is any way in which a meter could be marked with which the ordinary gas consumer would be perfectly satisfied?

The Chair—Not the average consumer; no.

Mr. McDonald—Except to put "naughts" over each dial. (Laughter.)

The President—Question 11: "What size of retort, how many retorts in each arch, and what width of arch for this particular size and number of retorts are best adapted for a works producing about 125,000,000 per year?

Mr. Dell—A hundred and twenty-five million is a pretty good output. I would recommend nothing smaller than sixes and nines. In benches of nines, the arches are usually about ten feet one or two inches; benches of sixes from seven feet eight to eight feet; and the size of retorts is about fifteen by twenty-six or sixteen by twenty-eight.

The Secretary—The purpose of the question seems to be to ascertain whether he shall put in nines or sixes.

Mr. Dell—Well, I should put in sixes, I think. It is a mooted question, however; that is determined usually by a man's own experience.

The President—Question 12: "In remodeling an old coal gas plant, situated within 70 miles of Pittsburg, with good local gas coal and cannel coal within 30 miles, would it be advisable to adopt water gas? If so, to what extent? Can anyone present grasp all those conditions and answer the question?"

The Secretary—It depends, possibly, somewhat on the size of the works.

Mr. Gywnn—I think I know probably where this works is, and I know what the gentleman wants to do. He could not use a water gas plant in it to good advantage, but I would advise him to erect a complete brand new plant, out and out, if he wants good light.

Mr. Persons—He had better put in a water gas plant, at least to make half of his gas. But I do not think anyone can answer that question from the floor. Certainly, a man who has retorts for sale would advise him to put in retorts, and a man who has water gas for sale would advise him to put in water gas, and it cannot be answered seriously, unless you know all the conditions. I think the man who asked that question would do very much better to consider the question privately with some well-informed gasman, and he would be very much better satisfied with the answer.

Mr. Shelton—I simply want to say that Mr. Persons has stolen my powder. It is a question that you cannot answer from the floor with any satisfaction; it has to be gone over in detail.

Mr. Coombs—I am situated about the same distance from Pittsburg as the gentleman who propounded the question, and perhaps I could answer for myself what I would do, and that would be about all. The plan that I would take there would be to make a mixed gas, coal gas and water gas, making a strong gas of 20 candle power. That would satisfy the locality where we are situated, considering the price of coal and the price of crude oil as these stand to-day. If the prices change, that will change the conditions, but, as we are situated to-day, I would say make both gases.

Mr. Gwynn—I will ask you this question: Suppose your output was one-fourth of what it is to-day. Would you then put in a water gas generator to do the enriching, or wouldn't you have to build a brand new works? The output of the works referred to by this gentlemen is about one-fourth of yours.

Mr. Coombs—I am speaking about what I would do under the conditions of to-day.

Mr. Gwynn—Would you put in a water gas generator with one-fourth of your present output? In a coal gas plant would you do that, and just use the generator for enriching?

Mr. Coombs—Well, I would not answer that just now; I will think about it.

Mr. Shelton—I think it is perfectly proper to think about it, for the reason that by putting in an improved water gas generator he might save sufficient labor to offset the cheap fuel, and at the same time have a higher candle power gas, and thus put the gas company in a better position for competing with an electric light company. I say that we should not look at it from one side of the question only. And, furthermore, if his boxes are small, a relief holder would make a perfectly easy flow of gas through his works.

Mr. Gwynn—The total holder capacity of the plant would not justify that. The only way that the gentleman can put in a water plant is to build a brand new plant.

Mr. Miller—You ought to give us the advantage of the same information you possess. Where is the works?

Mr. Gwynn—I do not wish to mention the gentleman's name or I would.

Mr. Boyle—I am the gentleman who asked the question, and I am interested in the gas works at Salem, Ohio. Our output is about six millions, and before expending about $12,000 or $15,000 on our works, I wanted to get at just such remarks as I have heard here upon the subject. I have taken the advice of private persons, but I wanted to listen to a general discussion upon the subject here.

Mr. Gwynn—Do you want to build a brand new works, or not?

Mr. Boyle—We are now receiving bids for a brand new works, and the question is whether we shall put in a partial coal gas plant with a water gas generator, or stick to a coal gas plant entirely and 18 candle power gas, or have a 20, 22 or 25 candle power gas. We have one electric light company, and since I came here I have learned that another electric light company was likely to come to Salem. I was informed to-day by Mr. Cooper that he has the contract; so that we will have two electric light companies and a gas company in a town of 7,000 population.

Mr. Persons—Under those conditions I do not see how he could do anything but put in a machine that will make high candle power gas, with which to meet competition. I do not see that he can do anything else.

The Secretary—I would like to ask Mr. Persons if companies furnishing high candle power gas are not suffering quite as much from incandescent electric light competition as those making low candle power gas? The company that is making the poorest gas in the State of Ohio is suffering less, I think, from competition with incandescent electric lighting than any company in the State.

Mr. Miller—What does it cost them to keep down competition?

Mr. Persons—The city you refer to is peculiarly situated in that respect, but I think in the smaller towns there is only one way to kill electric light competition, and that is by good candle power gas and thoroughly good service to the consumers in the way of fixing up their burners and maintaining a uniform and high candle power gas. I think that is the only way to do it.

Question 13: "Are explosions in blast pipes or fans attached to water gas plants usual? If so, how can they be avoided?"

Mr. Miller—I do not think that such explosions are usual. It is very easy to cause such explosions, if one wants to start out with the intention of exploding the blast pipe. In all modern and well-constructed gas plants, a vent pipe is put at the end of the blast pipe and the blower is kept running continually, so that in case the blast valve should lock, the gas will be blown out of the pipe. The pipe is made solid straight through. In a properly constructed and operated plant I never heard of such an accident.

The President—Question 14: "Can a fuel gas be made to sell at 25 cents per thousand feet with a profit?"

A Member—What heating value?

The Secretary—I think we would all answer, "No," to that question, if the gas was to be commercially successful. If anybody has the courage to say "yes," I would like to hear him speak.

Mr. McCall—I would say no, as you do.

The President—Question 15: "Is Dye's Patent Gas Washer a success?" Is Mr. Dye here? (Laughter).

A Member—Did Mr. Dye ask the question?

A Member—Does anybody representing Mr. Dye desire to present anything?

A Member—Does anybody know Mr. Dye?

The President—Seriously, can anybody answer the question?

Mr. Shelton—If no one knows what it is, and no one seems to respond to it, I would say it is not a success.

The Secretary—Some of us know something of it. I never saw one in use, but I have seen cuts of them and a description of their action, and the apparatus looked to me as though it would work; but I don't know anything about it otherwise.

Question 16: "What practical results are obtained with the Springer and Lowe double-superheater water gas apparatus as to weight of coke and quantity of oil used per thousand cubic feet of 20 to 22 candle gas made?

Mr. John Gwynn—I think you will find that about 45 lbs. of coke is a fair average and about six gallons of crude oil. He does not state the kind of coke and oil to be used; but take the best, and they will average about 45 lbs. of coke and 6 gallons of oil.

Mr. Shelton—I think the form of the apparatus, the output and the superintendent are all three factors, and are not embraced in the question. The amount of gas made, the style of the apparatus, whether old or modern, and the management, will make a variation of 100 per cent.

Mr. Penn—What kind of coke do you refer to?

Mr. Gwynn—I find the best result from the Fricke coke so far.

Mr. McCall—Is your machine modern?

Mr. Gwynn—Five years old; it is known as the Springer straight cupola.

The President—Question 17: "Does it pay to work up the ammoniacal liquor of a gas works carbonizing 1000 tons of coal per annum?" I don't know whether it is safe to submit to Mr. Osius the question to be answered.

Mr. Osius—That is a question which on its face seems to be somewhat like Question 15; but I can say that I am not the author of it. I should think it would pay; I should think it would probably return on the investment 20 per cent. net. Without knowing the local conditions of the particular works, I should recommend that any works carbonizing, say, from 800 tons up, would be safe in adopting the system of saving the liquor.

The President—Is that the minimum?

Mr. Osius—Yes, I would consider that the minimum; and I should think about 20 per cent. would be a fair estimate of the net result upon the investment, which would include all necessary apparatus and arrangements.

The President—Question 18: "Is the use of a positive blower in connection with a water gas recommended? If not, why not?"

Mr. Shelton—I don't want to talk water gas all the time, but since you have called upon me to answer the question I will say that I think it makes comparatively little difference. In nine cases out of ten the fan blower will do all the work that is needed and be much cheaper, and I think settles the question. Only in exceptional cases is a positive blower of any advantage. In probably 95 out of 100 plants the fan blower would do all the work required, and in a great many cases to advantage over the positive blower. And it is of cheaper construction.

The President—Question 20: "What is the best way to lower a gas main?"

Mr. Anson—Our plan of lowering a gas main has always been to excavate along one side of the line and underneath it, leaving little projections of earth underneath, or little piers holding the main up, particularly under the joints; and after the trench is completed, cutting the mains at the proper points and then lowering. Where the line of grade can be thrown in one direction instead of two, we simply make a reconnection at one end where we have cut it off, with a sleeve or some similar attachment, and run the grade in the proper direction, raising up the other end with an upright piece and reconnecting the main, using a drip-box at that point. There are no special tools or other arrangements for doing that kind of work.

Mr. Penn—I have had some experience in the last two or three years in that respect. My mode is similar to Mr. Anson's, except I use blocks of wood to hold up the main until I get ready to let it down, and then make the connection, letting it down gradually, of course.

The President—Question 21: "What is the best street drip, and the best way to put it in?"

Mr. Anson—We have a cast drip-box placed at the sidewalk, noting its location and keeping a record of the same, and connecting that drip-box to the main with a pipe tapped into the bottom of the main, not letting it extend too far in, but just far enough to prevent any sediment stopping up the outlet of the pipe, and letting this pipe drain towards the box.

Mr. Booth—Our plan is to make a drip of a pipe by putting a plug in it. The drips on the mains are cast, of course. We carry all of our drips out to the sidewalk. We have no patent drips or anything of that kind, but use just a common pipe.

Mr. Anson—Sometimes we use a pipe instead of the large cast iron drip-boxes. They are easier connected, and sometimes easier to get than the large cast iron drip-box.

The President—Question 22: "What is the best way to clean out a partially clogged or rusted main?"

Mr. Gwynn—I would like to know what the stoppage is, whether it is tar, or naphthaline, or rust or what. It would depend upon the nature of the stoppage as to what the remedy would be. If it were naphthaline you would have to take a different course to clean it out. If it were rust, I should say the best way would be to flush it out, the same as you do a sewer, having a good pressure back of it. If it were naphthaline I would say steam it out.

Mr. Miller—I would like to ask whether a main can rust inside.

The Secretary—I dont think any of us have had any experience with stoppages caused by rust forming on the inside of gas mains. I doubt whether the stoppage occurred from that cause.

Mr. McCall—I have had some experience with a rusted main. I don't know whether it was a rusted main or a stoppage in the main, but it appeared like rust. We have on our principal street a 6 inch main, and from that main we ran a 3 inch pipe leading down to a street where there is a 2 inch main. When we ran the 6 inch main we put in a couple of lengths of 3 inch pipe extending towards the 2 inch line. Last summer the line was shut off, and we supposed it was where the 2 inch and the 3 inch connected. I had a man cut it off at that point and the 2 inch line was perfectly clear, but when we reached the 3 inch line it was just chuck full of stuff that looked like—well, like iron sponge. (Laughter at the expense of Mr. Hayward.)

Mr. Miller—I think there is one company in this country that lays its mains very nearly level. I have no criticisms to make on their system of gas making, but I will say that a great deal of sludge accummulates in their mains. Periodically they cut their mains up into sections and put in a little traveler which they call a "hedge hog." They put water pressure behind it and drive it through the mains. The superintendent of the plant told me it worked very satisfactorily. They force this traveler through with water power.

Mr. McIlhenny—Wouldn't the water get in the service pipes and cause trouble there?

Mr. Miller—They cut them all off.

Mr. McIlhenny—I know of an instance where the pipes seemed to be clogged, or rusted, and when the question was brought up as to whether it could be forced out by some such method, it was thought that the labor of cutting off the service pipes would be great, and even then some sediment, or water, or whatever was used would come into that part of the service pipe that led up to the point at which it was attached.

Mr. Miller—What is the matter with shutting off the stop-cock?

Mr. McIlhenny—Would it not fill that pipe up to the stop-cock?

The Secretary—It would run out again.

The President—Question 23: "What is the best course to pursue in competition with incandescent light? In the absence of Mr. Starr I will ask Mr. Gwynn to answer that question.

Mr. Gwynn—The best course to pursue, I would suggest, would be to make a fine quality of gas and sell it to the consumer at as moderate a price as possible.

A member—How about governor burners?

Mr. Gwynn—After hearing the paper read by Mr. Butterworth, I would say also to use governor burners.

The Chair—Has the Secretary any experience in that line?

The Secretary—I know of no better way than to make good gas, sell it cheap, and push the business the best you can.

A Member—And put governor burners on?

The Secretary—Yes; and use governor burners.

Question 25: "With 60,000 China decoraters in the United States and some 20,000 kilns in use, why would it not be a good plan for gas companies to encourage the sale of gas kilns by agreeing to connect them free of charge to the purchaser. A gas kiln uses from 70 to 200 feet of gas an hour, and requires 2 to 3 hours for a firing!"

The Secretary—He simply asks whether it would not be a good idea for a gas company to encourage their introduction by making connections free of charge, etc. I think myself it would be a good idea.

The President—I think that is right along in line with the gas stove business, and the same policy would apply to it. That concludes the question box.

Votes of Thanks.

On motion of Mr. Gwynn, a vote of thanks was extended to the retiring officers, which they briefly acknowledged.

Mr. Wm. McDonald, at the request of the President, closed the meeting with a few pleasant remarks.

Natural Gas.

[A lecture delivered by Mr. John Young, Superintendent of the Allegheny Heating Company, before The Western University of Pennsylvania.]

The various theories concerning the origin of oil and gas may be divided into two classes—one assisting the chemical reactions of minerals or inorganic matter and those claiming an organic origin through the decomposition of vegetable or animal matter. According to the theory of the former, petroleum and marsh gas are formed by the action of water, carrying carbonic acid in solution, upon alkali metals existing in a free state and at a high temperature in the center of the earth; and they point the reactions that would take place, resulting in the formation of hydrocarbon compounds.

This theory considers the production of the liquid and gaseous hydrocarbons as continuous, the vapors rising as they are formed, the condensable portion forming petroleum and both the condensable and incondensable being retained in the porous strata in which they are now found. This theory would make the supply of these products inexhaustible as long as the necessary minerals and water exist, but the theory, though chemically perfect, is not generally accepted by geologists, since it does not accord with geological facts which point more to the organic origin of gas and oil—that is to their derivation from the decomposition of vegetable or animal matter originally contained in the rocks in which they are found, or in closely associated strata. Peat bogs yield inflammable gases, and sometimes also members of the bitumen series closely allied to petroleum, proving the decomposition of vegetable matter to be competent to produce natural gas and petroleum. While geologists are pretty well agreed as to the same from which gas and oil are derived, they differ somewhat as to the process of production. There is the distillation theory and the theory of primary decomposition. I shall cite Mr. S. F. Peckham as the exponent of the distillation theory. In his report on petroleum contained in 10th volume of the special reports of the United States Census of 1880, he states he considers petroleum was formed by distillation principally from beds of shale, fucoid plants and animal remains with limestone as a minor source, basing this view upon the variations in composition of petroleum found in different portions of the same field, which he thinks can only be accounted for on the theory of fractional distillation. In Pennsylvania, he says, gas and oil are derived from vegetable remains in rocks far below the present level of the strata in which they are found, the heat for their distillation being supplied by the causes that resulted in the upheaval of the Appalachian mountain system, and the evidences of this heat are to be found deep down beneath the unaltered rocks in which gas and oil are now stored.

As an argument against the theory of distillation, Prof. Orton cites the fact that the study of the rocks underlying the Ohio gas and oil fields as shown by means of boring carried 1,800 feet below the oil bearing strata shows no signs of metamorphism, which at this depth is below the only known sources of oil supply of the Pennsylvania type, would seem to condemn the idea of distillation. In favor of the theory of primary distillation he notes the fact that at the present day in Trinidad, beds of slate formed in comparatively recent times beneath the sea, but now raised above its level and containing abundant vegetable remains, are yielding petroleum in large quantities by direct decomposition of vegetable tissues, this petroleum passing into asphalt as a result of exposure to the atmosphere. If the action took place when the petroleum could be stored out of contact with the air it would remain as petroleum. This he considers is what has happened in the oil fields.

Prof. Orton's theory is that these oil fields were the site of a tropical sea, upon the floor of which the shales constituting the chief source of the oil were accumulated. The rivers emptying into the sea laid down sedimentary deposits of clay and sand, with occasional gravel bars. In the sea itself was a vast development of marine vegetation. Some of the especially abundant plants had very resinous spores and spore cases which were set free in enormous quantities, and in connection with other portions of these and similar plants were carried to the bottom in a macerated condition, there to pass through the coaly transformations resulting in the structureless carbonaceous matter that constantly characterizes black shales. The shales, thus slowly accumulated at the bottom of the gulf, must have behaved as similar shales do now, petroleum, marsh gas and bitumen being formed. This process continued until the materials were exhausted, producing a shale much richer in petroleum than any portion of it is at the present day. On this shale formation was laid a bed of porous sandstone saturated with sea water and roofed in by a very fine grained shale. Then, by a gradual exchange between sandstone and shale, the gas and oil reached their final reservoirs.

I have thus given somewhat in detail the two most prominent theories in regard to the production of petroleum and natural gas. Both theories assume that a shale containing the remains of plants and animals is the source from which they are derived. It seems to me the term, "a slow system of exchange," simply means a slow system of decomposition or distillation, and therefore differs from the other only in degree. Probably both causes have been at work to produce the different results found in different fields.

After further discussing geological features at some length, Mr. Young proceeded to speak of the chemical constituents of gas, and then passed on to the more practical phase of the question, the consumption of gas, dealing particularly with domestic uses. Natural gas is generally rated at 1,000 heat units per foot. The combustion of 1 cubic foot will raise the temperature of 1,000 pounds of water 1°, provided all the heat the gas generates is absorbed by the water. This, however, can only be accomplished by carefully constructed appliances. In ordinary use not more than from 50 to 70 per cent. of the heat generated is utilized. One cubic foot of gas will also raise the temperature of 48,000 cubic feet of air 1°, if the heat generated is all absorbed by the air, therefore, to raise the temperature of 48,000 cubic feet of air from zero to 70° requires the consumption of 70 cubic feet of gas, and to raise it from 35° to 70° requires 35 feet of gas; consequently it will require double the quantity of gas to raise the temperature in a building to 70° when the outside temperature is zero that it does to raise it to 70° when the outside temperature is 35°. In actual practice it takes more than double the quantity between these two points, as the greater the difference there is between the inside and outside temperatures the greater the inrush of cold air into the house and the greater the cooling effect of windows, etc. People often seem to forget this fact, but it is never overlooked by the silent recorder in the cellar, and when the bill comes in they open their eyes in amazement and immediately conclude the meter is a fraud and gas companies robbers of the worst description.

If we could only manage to utilize all the heat generated by the gas, a comparatively small quantity would be required to heat our houses; but, unfortunately, in the majority of appliances used for burning gas a large percentage of the heat is carried up the chimney, and it is more difficult to overcome this loss than might be supposed. For instance, in a furnace we have, which contains 95 square feet of absorbing and radiating surface, I find that with a volume of cold air passing into the furnace supplying three registers, and at a temperature of 30°, I cannot burn more than 30 feet of gas per hour and keep the products of combustion down to a temperature of 150°. You can easily see what a large percentage of the heat would be lost if the products of combustion from the 30 feet of gas went directly into the chimney instead of being drawn off by the radiators and passed on to the registers. In very few appliances for fireplaces are there any radiators, and the products of combustion pass directly from the burner to the chimney.

A large amount of water is formed in the combustion of natural gas, and if the products of combustion are too much cooled down the water vapor condenses and causes trouble. The products of combustion must be carried off at a temperature high enough to prevent condensation, or else an excess of air must be admitted in order to absorb and carry off the moisture; in either case considerable loss of heat ensues. Of course it is possible to utilize all the heat generated if the products of combustion are allowed to pass into the room; but this is not only injurious to health, but under certain circumstances may prove fatal. Natural gas contains about 75 per cent. by weight of carbon, and the product of its combustion is always carbonic acid gas—at least one foot of CO_2 for every foot of gas used.

I have stated that water is always produced in the combustion of natural gas. It is produced by the union of the hydrogen of the gas with the oxygen of the atmosphere.

According to the last census report, the average daily consumption of natural gas in the United States in 1889 was over 1,500,000,000 cubic feet. Taking 25 per cent. as the average proportion of hydrogen in the gas, the quantity of water produced daily would be 15,344,235 gallons.

The quantity of carbon carried daily through the pipes equals 24,454 tons. It is estimated that in 1889 natural gas displaced an amount of coal valued at $21,097,099. From this it will be seen the immense proportions the use of natural gas has assumed within the past 10 years. Before restrictive measures were fairly in operation the gas fields from which the gas was drawn had become so much exhausted that it was found necessary to largely cut down the use of gas for manufacturing purposes, and about two years ago it looked as if the supply would soon be at an end. However, new fields have been discovered,

and the gas companies have the drill constantly at work with the object of maintaining the supply. While it is not probable that in the future in this vicinity gas will be found in sufficient quantity to justify its use to any great extent for manufacturing purposes, I think that with the economy now practiced in its use we may have sufficient gas for domestic use for some years yet. However, the day may come when the supply of the natural article will be completely exhausted.

There seems to be a very general impression that there is some mechanical difficulty in the way of manufacturing and distributing a fuel gas. I know of only one obstacle in the way of manufacturing and distributing a fuel gas, and that is a commercial, not a mechanical difficulty. It may be said that a gaseous fuel is a luxury, as there is a substitute in the shape of coal which answers the same purpose. With the great majority of people there is a limit to the price they can afford to pay for a luxury, and the difficulty that confronts us in the manufacture of a fuel gas is how to produce it at a price that people can afford to buy it at. This is the problem that has to be solved, and not any difficulty in the manufacture and distribution.

The only fuel we have in sufficient quantity to be depended upon is coal. Over 200,000,000 tons were mined last year. The quantity of petroleum obtained last year was 5,000,000 tons, and when the amount used for illuminating purposes is deducted, a comparatively small quantity is left for fuel purposes. The quantity of oil obtainable is practically unknown, whereas there is sufficient coal in sight to last this country for generations. This being the case, it is evident that if gaseous fuel should be anything like universally used, coal is the only substance that can be depended upon to produce it.

There are three systems of converting coal into gas. The products of the three systems are termed producer gas, water gas, and illuminating gas. In the first two processes the whole of the coal with the exception of the ash is converted into gas. In the third process only the volatile constituents of the coal are gasified, and there are coke, tar and ammonia left as residuals. By the producer process a large volume of gas is produced—120,000 cubic feet, or even over that quantity, per ton. This gas can be produced very cheaply per 1,000 feet, and is suitable for a great variety of manufacturing purposes; but it is not at all suited for distribution. It contains a large proportion of inert nitrogen, which increases its bulk, reduces the heat units per foot and lowers the flame temperature. Seven feet of this gas are only equal in heating power to one foot of natural gas, and the size of pipes, meters, etc., necessary for its distribution would prevent its use for domestic purposes, even if it had no other objections.

In the second process—that of water gas—the object is to get rid of the large volume of inert nitrogen. The combustible gases produced are the same as in the producer process—viz., carbonic oxide and hydrogen—and its higher heating power is due simply to the absence of nitrogen. To get rid of the nitrogen involves a great waste of fuel, which is consumed in maintaining a sufficiently high temperature to decompose steam. A cubic foot of water weighs 62½ pounds, and consists of 16 parts of oxygen to 2 of hydrogen. The oxygen weighs 55.556 pounds, and the hydrogen 6.944 pounds. These weights represent 1,320 cubic feet of hydrogen and 660 cubic feet of oxygen. The oxygen, when converted into carbonic oxide, doubles in volume. The cubic foot of water, therefore, produces 1,320 cubic feet of hydrogen and 1,320 cubic feet of carbonic oxide. The oxygen in forming carbonic oxide gas combines with 42.221 pounds of carbon, equal to 16 pounds of carbon for every 1,000 cubic feet of the mixture of water gas. In order, however, to produce 1,000 cubic feet of water gas, it is necessary to consume about 60 pounds of coal or coke. Now, 60 pounds of coal burned direct will develop about 800,000 heat units, while 1,000 cubic feet of water gas will only develop 325,000 heat units. You will, therefore, see it is not at all an economical process.

Gas manufactured by this process is sold for fuel purposes on a limited scale in Chicago, Jackson, Mich., St. Joseph, Mich., and some other points, but so far as I can learn, its use is almost exclusively confined to cooking purposes. Even in Chicago, where coal is much higher than here, very few people can afford to pay 30 cents per 1,000 cubic feet (which is the price it is sold at) for a gas that will develop only from 300 to 400 heat units per foot. The price is equal to natural gas at 75 cents per 1,000 feet; and our present experience indicates that we could not sell very much natural gas at that price. I believe, however, if we could sell a gas giving from 600 to 700 heat units per foot for 25 cents per 1,000 cubic feet, there would be a large demand for it for cooking and heating purposes. Being a manufactured article, people would feel confidence in its permanancy, and would feel justified in going to the expense of fitting up their houses with suitable appliances for using the gas with the greatest economy. There would be no excuse for failure of supply in cold weather. Ample manufacturing plant would provide against that. Instead of depending upon the uncertain supply from gas wells we would have the production entirely under control. In ordinary coal gas we have a gas that will produce the heat units per foot I have named. The question is, can it be produced and sold at 25 cents per 1,000 cubic feet? I believe it can. Some changes in the existing system of manufacturing the gas will have to be introduced in order to reduce the cost of labor and produce a coke that will command a more extensive market and a better price, and there is no doubt this can be done. Even with the present system of manufacturing, I believe, illuminating gas could be sold for cooking and heating purposes, at as low a price per heat unit as any other fuel gas that can be manufactured. It is the amount of heat a foot of gas will develop that determines its value to the consumer. I believe it will be on this line that the problem of fuel gas will be solved, and not by any system of greased air or carbureted producer gas, or even water gas. In fact I do not see that any system that depends for revenue on gas alone can be a success commercially. It cannot be sold cheap enough. My idea is to depend largely for revenue on the other products of the coal, viz., coke, tar, ammonia, etc., and sell the gas at the lowest possible price that will give a reasonable return on the capital invested.

With producer gas used for manufacturing purposes, with the volatile portion of the coal (which produces all the smoke) converted into gas and used for cooking and heating, with coke used for firing boilers, etc., why should not Pittsburg and Allegheny be made as free from smoke as they were during the greatest supply of natural gas? There is certainly nothing impossible about it, and I feel pretty sure that on the whole it would effect a great saving.

The Present Status of the Storage Battery.

Messrs. J. K. Pumpelly and C. Sorley presented this joint contribution before a meeting of the Chicago Electric Club:

In order to put before you in a concise form the status of the storage battery at this date, it is necessary to go somewhat into its history. Plante in 1860 published the fact that he had discovered a method of storing electricity by using certain metals immersed in certain solutions, and that he had obtained the best results from sheet lead immersed in dilute sulphuric acid and subjected to a long process of alternately charging, discharging and reversing for the purpose of forming a layer of active material upon the surface of the sheet lead; but unfortunately this process of forming the active material was very costly, owing to the great length of time required.

In 1881 Faure brought out a battery in which he used the same material, namely, lead and dilute sulphuric acid, but instead of making the active material out of the plate itself, as Plante did, he applied an active material or material to become active to the plates, in the form of a paste, paint or cement. This was a great advance so far as cost of production was concerned, but not when viewed from other standpoints, as it introduced some very serious defects, the greatest of which was the liability of the active material to scale off, or in other words, to become detached from the plates. This would not only cause loss of capacity, due to loss of active material, but these scales were liable to lodge between the plates and short circuit the battery. The aim, therefore, of all makers of storage batteries since the Faure battery came out has been to so construct a battery that it should be impossible for the active material to fall off the plates. This has been accomplished in various ways, but almost invariably the result has been the introduction of another serious defect, namely, greater internal resistanse, and therefore less efficiency; for if the internal resistance is increased it will necessarily take a greater electromotive force to put a given quantity of current through the battery, while in discharging this internal resistance will be added to the external resistance of the circuit, and cause a corresponding loss in the discharge.

One of the greatest stumbling blocks in the way of inventors who have tried to find a means of keeping the active material from falling off the plates has been the universally accepted idea that it is absolutely necessary to have a free circulation of the solution. After a long series of experiments we have found that this is not necessary, providing a porous and also absorbent substance (capable of absorbing the sulphuric acid as fast as it is made in charging) has been placed between the plates.

This is a very important discovery, for it not only makes it impossible for the active material to fall off or out of the plates, but it enables us to jam the plates up close together and so make one solid compact mass

of the element, without any free solution to spill over everything when the battery is used for traction and other analogous purposes, and it also adds a number of years to the life of the battery, for, when the positive plates would not be able to support their own weight if made in the old way, where every plate stands alone, by this method the negative plates will support them, and it also enables us to lower the internal resistance by bringing the positive and negative plates so much closer together.

We have also found that no matter how well a battery may be constructed it is not possible to get as good results from one constructed upon the Faure principle (that is to say, with a mechanically applied oxide) as can be obtained from one made on the Plante principle. This brings us down to the question, can a Plante battery be made commercially successful, that is to say, can the electro chemical process of forming the active materials out of the plates itself be shortened from several months to a few days or hours?

We are glad to be able to answer that question in the affirmative. By a process discovered by Mr. Sorley, after seven months of costly experimenting by Mr. Sorley and myself, we have succeeded in developing a Plante battery in which the active material is made electro chemically in 1 hour and 50 minutes. We are glad to produce before you one of the batteries containing all the latest improvements as I have described them.

It has been said that storage batteries will never do for street car work, owing to the fact that when a car is climbing a heavy grade the demand on the battery for current is so great that it will not maintain its electromotive force, and that consequently when you exceed a certain number of amperes the voltage falls in porportion and you do not get any more watts, or in other words, although you are discharging the battery at a greater rate you do not get any more energy. Now, this is true to a certain extent, of a battery made with a mechanically applied oxide, but not one where the active material is electro chemically made, as Mr. Sorley will illustrate to you with the battery before you, which contains an element that only measures 6x6x6½ inches, but which has a capacity of 177.7 ampere hours, discharging at a rate of 23 amperes. He will show you that it is possible to discharge it as high as 75 to 85 amperes for. say, 20 minutes, which is ample time to climb a grade, and that this discharge of, say, 80 amperes for 20 minutes will not lower the voltage more than 5-100 of a volt; that is to say, the electromotive force during this large discharge from so small a cell will remain constant at 1.95 volts.

Now this electromotive force, with the usual number of cells that are placed in a street car series, would produce at the terminals of the motor, at the discharge rate of 80 amperes, nearly 21 horse power, or accurately, 20.9 horse power.

Allowing that the test is to a great extent convincing to you, you will naturally ask, how do you know that this form of Plante battery will be any more durable, or that the plates will remain firm and intact any longer than the pasted or mechanically applied oxide plate?

In answering such a question, we have to judge by our experience and our knowledge of the chemical action on the plates. The constant tendency of this chemical action on the pasted plate is that of slow disintegration, caused largely, in our opinion, by the impurities that are introduced into the plate in the oxides of lead which are mechanically applied, whereas all the impurities which may be in the lead plate itself are dissolved out and remain in the first solution, and consequently the peroxide and spongy lead that are subsequently formed are made out of perfectly pure lead, and there is no longer any chance of disintegration arising from local action. While on the subject of rolled lead, it would be proper to mention that the plates in this cell before you are made from one integral sheet of lead ⅛ of an inch thick and prepared for treatment by a new method patented by us, which does away with all joints or soldering, thus avoiding any chance for local action. Aside from this, the process greatly cheapens the cost of making the plate.

One fact we have learned to aid us to a further conclusion, and that is that when pure rolled lead, such as this battery is made of, is used for the electrodes, the plates are far more durable than when constructed of cast lead, even when the active material is mechanically applied, and we know of plates so constructed that have lasted for five years. In conclusion, we wish to say that for lighting purposes where weight is not an objection there is no reason why a storage battery should not be made that would last for 20 years, and this being the case, there is no reason why storage batteries should not take the place in electrical work that the gasometer now takes in gas engineering, that is, act as a reservoir from which to distribute current from central stations.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. W. T. Sanborn, who was for some time connected with the Dover (N. H.) Gas Light Company, has retired from the gas business.

Mr. M. L. Hickey, who has capably served for 8 years the El Paso (Texas) Gas, Electric Light and Power Company as its Superintendent, resigned that berth on March 18. He is now open for an engagement. Mr. Hickey is a competent man, and his experience in the manufacturing and distributing divisions of the works with which he has been connected covers a period of 18 years.

Mr. Wm. Tracy seems to be well satisfied with the outlook at his new post of Superintendent to the Leavenworth (Kansas) Light and Heating Company, and believes that he can do good work there. He has arranged to put down some new mains this summer, so far having laid out plans for 4,000 feet of 6 inch and 3,000 feet of 4 inch. Mr. Tracy asserts that he will not put down pipe of smaller diameter than 4 inch; and he is right.

Another thing that Mr. Tracy's Company has done is to compile a prettily put together pamphlet for distribution amongst the residents. The front cover carries a well printed cut of the dial of a gas meter, and the title of the pamphlet is "How to Read a Gas Meter, with Other Important Information." Between the covers the reader will find 8 clearly printed pages, a perusal of which ought to fit him for the position of meter taker; and following the rules for reading the meter and writing out the statement come several useful hints as to how burners may be kept in order, the sensible practice to observe in the case of a gas leak, the value of gas as a cooking and heating agent, and so on. The Company keeps full lines of cooking and heating stoves, and offers to sell the same to consumers at "actual wholesale price."

Mayor Pingree, of Detroit, seems to have a very bad attack of the municipal lighting fever, and it must be added that many of his aids have also been afflicted by the virus that entered the veins of their Chief. It looks to be, however, that they favor most ardently the installation of a plant for the furnishing of electric lamps with current, and with that end in view have, through the agency of Mr. Frank B. Rae, secured three preliminary estimates, as to cost of construction, maintenance, etc., of such service. The estimates are appended:

Estimate No. 1.—For 2,000 arc light plant, complete, with fireproof building, direct-coupled engines and dynamos:

Real estate and building	$35,800 00
Boilers and appurtenances	44,000 00
Engines and connections	58,000 00
Dynamos and station electrical appliances	70,000 00
Contingent, 5 per cent	10,090 00
Total cost of station	$217,890 00
Lamps, lines, etc.:	
Distributing converters	$30,000 00
2,000 arc lamps	60,000 00
2,000 iron poles or mast arms, complete, at $20	40,000 00
500 miles of pole line, $200 per mile	100,000 00
20 miles of conduit system, including copper wire, complete	80,000 00
Contingencies	10,000 00
	$320,000 00
Total investment	$537,890 00

Cost of operation and maintenance per year, station to run 12 hours per day, at 2,000 horse power:

Office expense	$6,000 00
Power plant employees	11,540 00
Fuel and maintenance	24,090 00
Repairs, and depreciation of power plant, at 5 per cent. on $172,800	$8,640 00
On building, at 2½ per cent	600 00
Oil, waste and supplies	3,000 00
Interest on station and power plant, 4 per cent. on $201,800	8,072 00
	$61,942 00
Cost per horse power per year delivered to line	27 97

Cost of maintaining lamps and lines per year, 2,000 lights:

Trimmers, repairers and underground conduit men, 35; at $2 per day	$25,550 00
2,000 pairs of carbons, per day	14,600 00
Repairs and depreciation on lamps, lines and converters, at 3 per cent	6,900 00
Repairs and depreciation on conduit system, at 3 per cent	2,400 00
Interest on lines, lamps, conduit system, etc., at 4 per cent	12,800 00
	$62,250 00
Cost per lamp per year for line and lamp maintenance	31 12
Total cost per year	124,174 00

Total cost per lamp per year:

Expense of Commissioners' office per lamp per year	$ 3 00
Cost of power delivered to line per year	27 97
Cost of lamp and line maintenance per year	31 12
	$62 09

Estimate No. 2.—

Cost of plant, as per Estimate No. 1 ..... $537,890 00

Cost of operation and maintenance per year, based on moonlight schedule of 1893; calculated on plant to start one half hour after sunset and one hour before moonset, and to stop one hour after moonrise and one hour before sunrise.

Hours of station operation:

	H.	M.
January	206	10
February	193	40
March	175	40
April	153	50
May	144	10
June	137	50
July	152	00
August	164	20
September	180	20
October	212	10
November	219	00
December	244	20
	2,183	30

Total cost per year:

Expense of Commissioners' office	$6,000 00
Cost of power	42,627 00
Cost of lamps and line maintenance	54,930 00
	$103,557 00

Total cost per lamp per year:

Expense of Commissioners' office	$ 3 00
Cost of power per lamp per year	21 31
Cost of lamp and line maintenance	27 46
	$51 77

A saving of $20,640 per year in cost of operation over Estimate No. 1.

Estimate No. 3.—

For 2,000 arc light plant complete, with fireproof building, engines, driving countershaft, belted dynamos:

Real estate and buildings	$45,000 00
Boilers and appurtenances	72,000 00
Dynamos and station electrical appliances	65,000 00
Contingent	11,400 00
Poles, lines, etc	47,000 00
Total cost of station	$240,400 00
Lamps, lines, etc	300,000 00
Cost of operation and maintenance per year, station to run 12 hours per day	66,255 00
Cost of horse power per year delivered to line	33 12
Cost of maintaining lamps and lines	60,450 00
Cost per lamp per year	30 22

Total cost per year:

Expense of Commissioners' office, per year	6,000 00
Cost of 2,000-horse power per year	66,255 00
Cost of maintaining lamps and lines, per year	60,450 00
	$132,705 00
Cost per lamp per year	66 33

Operated under the moonlight schedule, as per estimate No. 2, the cost of maintenance per lamp per year will be $56.

THE Bouton Foundry Company, of Chicago, has closed its "city offices," which were located in the Monon Building, and now transacts all its business at the general offices, corner Union avenue and 39th street, Chicago.

THE following letter rather conclusively shows that the JOURNAL is appreciated:

HAVERFORD, PA., April 3, 1893.

Messrs. A. M. Callender & Co., 32 Pine street, New York:

Gentlemen—Enclosed please find postal note for $3, the same being subscription for the AMERICAN GAS LIGHT JOURNAL for the ensuing year, beginning with March 20th number. Since leaving Williamsport the last of the year I have been traveling in the South, and never supposed I should miss the JOURNAL; but as I find I cannot do without it any better than the daily papers, please forward to this address, until further notice, and oblige Yours very truly,

C. A. BYERS.

MR. J. E. RICHARDS, for many years Superintendent of the gas works on the site of the United States Military Academy, West Point, N. Y., has resigned. We understand that Mr. J. A. Norcross, formerly in the employ of the Consolidated Gas Company, 92d street station, will succeed Mr. Richards.

THE employees of the Fall River (Mass.) Gas Company have been equipped with fire badges, that will secure their admission inside the fire lines during the progress of a conflagration. The Fire Marshall has directed that the badges be recognized.

COL. AUGUSTUS P. SHERMAN, for many years a Director in the Bristol (R. I.) Gas Company, died at his home in Newport, R. I., on March 25th. He served through the War of the Rebellion, and was a member of the Newport Artillery at the time of his death. He represented Newport county in the State Legislature for two terms, and also occupied a prominent place in the Directorate of that sterling financial institution, the National Bank of Rhode Island.

"OBSERVER" forwards the information that, at a town meeting held on March 25th, it was voted 254 to 97, that it was expedient for the town to purchase the plant of the Middleboro Gas and Electric Company. Messrs. Eugene P. Le Baron, George E. Wood and David G. Pratt were appointed a committee to ascertain the prices and terms on which the plant may be purchased, to determine the needs of the town in the direction noted, and to report them at a future meeting. It has been stated that the proprietors of the Company will accept a price not far from $180,000.

THE plant of the McKeesport (Pa.) Electric Light Company was destroyed by fire on the morning of March 31st, the loss being put at $40,000. The property was insured for $25,000. The carelessness of a workman carrying a lighted torch, the flame from which set fire to a can of oil, is responsible for the disaster.

THE contract for a new holder, for the Jamaica Plain (Mass.) Gas Company, to rest in a steel tank, the same to have a storage capacity of 250,000 cubic feet, has been awarded to the Davis & Farnum Manufacturing Company, of Waltham, Mass. This firm also has the following orders on its books for new work: A 60,000 foot holder, to rest in a steel tank, for the Westfield (Mass.) Gas Company, and a set of purifiers, 8 feet by 12 feet, for the same Company; a set of purifiers, 24 feet by 12 feet, for the Pawtucket (R. I.) Gas Company.

THE Berlin Iron Bridge Company, of East Berlin, Conn., has been awarded the contract for the new rolling mill building for the New Haven (Conn.) Rolling Mill Company.

WE are in receipt of advance copies of the Eighth Annual Report of the Massachusetts Board of Gas and Electric Light Commissioners, which presents in nice detail the working of the various Companies in the State engaged in the supply of gas and electric lighting for the twelvemonth ended June 30th, 1892. As usual, the Commissioners are to be congratulated on the cleverness of the way in which their report is compiled, and this speaks volumes of commendation for the system that must prevail in their methods; for it must be remembered that the Board was more or less disarranged last year, through the resignation of Col. J. W. Coveney, and the acceptance by the Board's former effi-

cient Secretary, Mr. Walter S. Allen, of a position on the staff of the Bay State or Boston Gas Company. Then, too, other difficulties transpired to "mix matters up;" for the questions that came before the Board in the year were not only far more numerous than hitherto, but but were also of a more complicated nature than formerly. With this premise we make the following recapitulation of the matters treated in the report. Having mentioned the resignations of Col. Coveney and Mr. Allen—a very pretty tribute is paid to Mr. Allen on the score of his specially valuable services to the Board—we find it stated that the Board has supervision of 136 companies, of which 26 companies supply both gas and electric light, 47 companies supply gas only, and 63 only furnish electric light. The Commissioners refer to the beneficial effect of the amendment to the acts, prescribing a per diem penalty for delay by companies in filing their annual returns. In fact, the promptitude was so noteworthy that the Commissioners were enabled to compile their report at a very much earlier date than ever before. Following this the report notes the sale under foreclosure of the Gardner Gas Light Company, which property was purchased by Mrs. Maria L. Ruggles, of Worcester. Since the sale "the Company has supplied no gas, has held no visible property, and the plant has been managed, and the business conducted in the name of Mrs. Ruggles." Having noted the direct and complete consolidation of the Lawrence Gas Company and the Edison Electric Illuminating Company, of Lawrence, (June, 1892), commented on the decision adverse to the Walworth Light and Power Company, of Boston, and reported the changes in corporate titles of four companies, the report affirms that four new corporations for the distribution of electricity for light were organized during the year—to operate at Hull, Natick, Worcester and Boston, respectively. The nominal capital of the four companies is $62,000. It is also noted that the only new application received by the Board during the year from a gas company for leave to engage in the supply of electric light came from the Lexington Gas Light Company. During the year the Companies at New Bedford, Haverhill and Chicopee, put in water gas apparatus, and are now distributing a mixed gas to their patrons, and the Athol Company has returned to the practice of distributing water gas only. During the year, for a portion of the time, the Marlboro Company tried a wood gas for enriching purposes, but eventually dicontinued the plan. The Millis Company has also added to its business the supplying of electric lights in that town. The works of the Roxbury and Dorchester Companies remain closed, they distributing a gas bought directly from the Bay State Company, under whose control they are. The report refers to the plant enlargement at the North End section of the Boston Gas Light Company, and intimates it is the intention of the Company "to distribute only water gas in the near future." Referring to the dispute between certain gas consumers of Wakefield and Reading and the Citizens Gas Company, which operates in both places, the contention being that the gas was foul beyond the permissions of the statute, we find it stated that "The usual analysis of the gas and test for candle power impurities revealed no extraordinary conditions—and no violation of the statutory requirements, except in respect of the presence of sulphureted hydrogen. The gas had an unusually strong and offensive odor, which upon further examination appeared to be due to a particularly poor and sulphurous lot of coal, which the Company had been using. In view of the fact that immediately upon notice of the complaint the Company arranged to abandon the use of this coal, and of the further fact that the cause of the complaint soon afterward disappeared, no order upon the petition was considered necessary." Then follow, in regular sequence, reports of the appeals entered and decided before the Board in several cases, all of which hold many interesting points. The appeal of the Consumers' Gas Company, of New Bedford, exhaustive mention of which has hitherto been made in the JOURNAL, is reported at great length, as is also the case of the appeal of the Marlborough Gas Light Company from the decision of the selectmen of that town, granting the Citizens Gas Light Company the right to build and operate a gas works. It might be as well to add here that the Commissioners sustained the appeal and reversed and annulled the grant of the selectmen. The report also deals largely with the question of municipal ownership of gas and electric lighting plants, and gives a succinct account of the present status of the attempts now underway in various places in the State to take up the work of supplying artificial light on municipal account. Having discussed at some length, what the Commissioners term "Violation of Laws," the number of accidents whereby persons sustained bodily injury from gas and electricity manufactured and sold for light and fuel during the year 1892 is discussed. Gas is chargeable with 24 "accidents," of which 18 resulted fatally, and electricity is held accountable for 7 "accidents" to persons, 4 lives having been lost. The history of each "accident" is given in detail. This concludes the general introduction matter, and at this point we leave the further present consideration of the document, reserving for next week a synopsis of the statistical matter.

THE proprietors of the Santa Ana (Cal.) Gas Company have reduced their selling rates to $2 per 1,000, for illuminating and cooking purposes, and to $1.50 per 1,000 for power. The Santa Ana *Blade*, by the way, is printed on presses operated by a gas engine.

THE Washington *Star* says, that in the last appropriation bill for the District of Columbia there is a clause providing that the Gas Light Companies shall deposit with the Collector of Taxes $1,000, for the payment of the salary of an Inspector of Gas Fitting. In a letter to the Commissioners, Plumbing Inspector Robinson calls attention to this fact and requests that the Gas Companies be notified to deposit with the Collector of Taxes an amount sufficient to pay the salary of this officer from April 22d, when the plumbing regulations take effect, to the end of the present fiscal year. The matter was referred to the Attorney for an opinion, as to whether the Commissioners have authority for taking action earlier than July 1, 1893.

THE proprietors of the Gas Company, of West Chester, Pa., have compiled for distribution amongst their consumers a prettily bound pamphlet, profusely illustrated, the title of which is "Facts Interesting to all Who want Perfection in Light, Heat and Fuel, at Minimum Cost." The pages of the pamphlet abound in telling arguments, supporting the good policy of employing gas for lighting, cooking, heating, etc., and we have no doubt whatever that the West Chester Company will add many new names to its roll of consumers; and that those already its patrons will use more gas than they ever did before.

WE have notice of the incorporation of the Champaign (Ills.) Fuel and Gas Light Company. The incorporators are returned as Messrs. Warren Maltby, Peter S. Repfogle and John W. Stipes. It is capitalized in $50,000.

A BILL introduced by Mr. Chesley in the Minnesota Legislature, which is general in its terms, proposes to confer upon the authorities of villages the right to issue bonds for the construction of gas and electric light plants.

AN odd clause in the notification of the reduction in gas rates and so on, recently issued by the Detroit Gas Company, is the following: "Failure to receive gas bills will not constitute a claim for discount. The Company will render bills promptly by mail, and will not be responsible for non-delivery."

THE committee appointed by the Massachusetts Legislature, under the resolution to name a "Gas Investigating Committee," is composed of the following: Lyford, of Springfield; Meyer, of Boston; Galloupe, of Beverly; Moriarity, of Worcester; Rosnosky, of Boston; Joy, of Winchester; Malone, of Greenfield; Ackley, of Fitchburg; O'Neill, of Chicopee; Hall, of Woburn; Kohlrausch, Billerica; Whitney, of Roy-alston; McLoughlin, of Milford; Gage, of Monson; Hammond, of Quincy.

LATE last month the Minneapolis (Minn.) Gas Light Company applied to the authorities for permits to construct the following: A double lift holder 127 feet in diameter, to be located at 20th avenue, South, and First street; a 2½ story brick and iron building, to contain new purifying apparatus, to be located on Cedar avenue and River Bank, and for a steel oil tank, adjoining the purifier house. The holder and oil tank are to be enclosed by brick structures, and the estimated cost of the named improvements is put at $90,000.

THE Reverend Frank Haven Hinman, of the Fourth Presbyterian Church, of Boston, evidently having despaired of finding a suitable text for a sermon in any of the lines of the Holy Book, recently treated his parishioners to a harangue from the pulpit on the subject of "Fixing the Price of Gas—A Sweeping Reform." The reverend gentleman was sadly astray in his facts, and we sincerely hope that his theology at large is better founded than is his gasology.

THE Western Gas Construction Company, of Fort Wayne, Ind., will build new shops on a site just east of the Bass Foundry, in that city.

THE proprietors of the Davenport (Ia.) Gas Company have sued Edwards & Walsh, local contractors, for $344.40, the value of 122,000 cubic feet of gas, together with the cost of repairing a break in their street mains, caused by the negligence of the defendants in the construction of a sewer.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

EDITOR—Jos. R. Thomas, C.E.
ASST. EDITOR—T. J. Cunningham.
MANAGER—C. E. Sanderson.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 32 Pine Street, New York.

This is a recognized official organ of
LIGHT, HEAT, STEAM, WATER SUPPLY,
VENTILATION, SANITARY IMPROVEMENT,
AND GENERAL SCIENCE

TERMS:

SUBSCRIPTION—Three Dollars per annum, in advance. Single copies, 10 cents.

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NEW YORK.—AMERICAN NEWS Co., 39 and 41 Chambers Street.
Germany.—B. WESTERMANN & Co., of New York.

MONDAY, APRIL 10, 1893.

The Market for Gas Securities.

Consolidated opened to-day (Friday) at 130 bid, and there was some fair inquiry for the shares, with every likelihcod that the close of the day's business would see at least fractionally higher figures recorded in it. Legislation at Albany does not seem to be liable to oppress the Companies this year, so it may be taken for granted that every city gas stock is a purchase, and Consolidated and Mutual look to be the best in which to make either a turn on speculative account or for investment. Standard preferred is also inquired after, and the quotations for it are gradually hardening. Some very disquieting things were said about Mr. Addicks and his Beckton Construction Company shares in the New York daily prints this week, but the irrepressible gentleman, whose trail in the gas business may be followed from the Gulf to Boston Harbor, grins under the strokes, and keeps the other cheek in view.

Over in Brooklyn another element in the situation was the handing down of a decision from General Term of Supreme Court in the Equity demurrer, which can be fairly said to be unique. Perhaps the learned gentleman who prepared it understands the same, but life is too short to justify others in attempting to solve it, therefore, we pass. Broklyn shares are in a seemingly doubtful state, and the tendency seems to be towards lower prices. Chicago gas is up to 92¾ bid, and Bay State hovers between 31 and 32. Baltimore Consolidated is at last striking its gait, being bid for freely at 64½. It is a purchase. Lacledes are dull and lower, and San Francisco is feeling the impulse of inquiries evidently made in speculative account. There is little doubt that some important changes will soon be reported in the affairs of the Newark (N. J.) Companies.

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